#1

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
SAM NUNN ATLANTA FEDERAL CENTER
61 FORSYTH STREET, S.W.
ATLANTA, GEORGIA 30303

July 28, 2009

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

SF-FFB

Mr. Terry Hazle
Environmental Management Division
U.S. Army Garrison-Redstone
4488 Martin Road
Redstone Arsenal, AL 35898

SUBJ: Final (Rev 1) Installation-Wide Groundwater (IWGW) Land Use Control (LUC) Remedial Design (RD) – (May 2009) Redstone Arsenal, Madison County, AL (US EPA

Dear Mr. Hazle:

EPA, R4, has completed its review of the above subject document and the Land Use Control ROD Checklist for the subject Land-Use Control Remedial Design. This LUC RD for installation-wide groundwater provides information on how LUCs and the off-post coordination of the remedy selected in the CERCLA Interim Record of Decision for IWGW will be implemented and maintained. Based on this review, the EPA concurs with the submittal.

If you have any questions, please do not hesitate to contact Michelle Thornton at 404/562-8526 or thornton.michelle@epa.gov if you have any questions about this memorandum.

Sincerely,

Michelle P. Thornton
Remedial Project Manager
U.S. EPA, Region 4

Cc: Terry De La Paz, RSA
Philip Stroud, ADEM

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#2

Final

Installation-Wide Groundwater Land-Use Control Remedial Design

Redstone Arsenal
Madison County, Alabama
U.S. EPA ID No. AL7 210 020 742

May 2009

Delivery Order 0022
Contract No. DACA21-96-D-0018
Project No. 109774

DEPARTMENT OF THE ARMY
US ARMY INSTALLATION MANAGEMENT COMMAND
HEADQUARTERS, UNITED STATES ARMY GARRISON, REDSTONE
4488 MARTIN ROAD
REDSTONE ARSENAL, ALABAMA 35898-5000

REPLY TO
ATTENTION OF

IMSE-RED-ZA

01 JUN 2009

MEMORANDUM FOR US Environmental Protection Agency, Federal Facilities Branch (Ms. Michelle Thornton), Waste Management Branch, 61 Forsyth Street, SW, Mail code 4WD-FFB-10th Floor, Atlanta, Georgia 30303-34013
Alabama Department of Environmental Management, Government Facilities Section (Mr. Philip Stroud), Hazardous Waste Branch, Land Division, 1400 Coliseum Boulevard, Montgomery, AL 36130-1463

SUBJECT: Final Installation-Wide Groundwater Land-Use Control Remedial Design, Redstone Arsenal, Madison County, Alabama

1. Reference the Installation Restoration Program at Redstone Arsenal, Alabama (EPA ID AL7 210 020 742).

2. This letter transmits one hard copy of subject document (enclosed) for your review and concurrence.

3. My point of contact for this report may be directed to Ms. Terry de la Paz, Environmental Management Division (IMSE-RED-PWE), 256-955-6968, e-mail:terry.delapaz@us.army.mil..

Encl

ROBERT M. PASTORELLI
Colonel, LG
Garrison Commander

Copy Furnished (w/enclosures):
Mr. Jim Ashworth, Tech Law, Incorporated, 310 Maxwell Road, Suite 500, Alpharetta, GA 30009
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US Army Environmental Center, Installation Restoration Division (SFIM-AEC-CDP, Ms. Lia Gaizick), Building #E4480, Aberdeen Proving Ground, MD 21010-5401
Wheeler National Wildlife Refuge (Mr. Dwight Cooley), US Fish and Wildlife Service, 2700, Refuge HQ Road, Decatur, AL 35603

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Alabama Department of Public Health (Mr. Kenneth Calhoun), 201 Monroe Street, Suite 1450 Montgomery, AL 36104
Tennessee Valley Authority, Pickwick/Wheeler Watershed Team (Mr. Randy McCann) Post Office Box 1010, SB-1H-M, Muscle Shoals, AL 35662-1010
Marshall Space Flight Center (Mr. Farley Davis), Building 4200, Mail Code AS-10, Marshall Space Flight Center, AL 35812
US Army Center for Health Promotion and Preventive Medicine (MCHB-TS-REH, Mr. Larry Tannenbaum), Building #E-1675, Aberdeen Proving Ground, MD 21010-5403
Mr. Zhenhua Jiang, PhD, Z-GeoInfo Inc., 200 E Joppa Rd, Suite 400, Towson, MD 21286

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May 15, 2009

109774-SHAWCHO-0304

DEPARTMENT OF THE ARMY
CESAS-PM-H (Ms. Juana Torres-Perez)
U.S. Army Corps of Engineers, Savannah District
100 Oglethorpe Avenue
Savannah, Georgia 31402

Contract: Total Environmental Restoration Contract
Contract DACA21-96-D-0018, Task Order 022

Subject: Submittal of the Final Installation-Wide Groundwater Land-Use Control Remedial Design, Redstone Arsenal, Madison County, Alabama

Dear Ms. Torres-Perez:

The *Final Installation-Wide Groundwater Land-Use Control Remedial Design, Redstone Arsenal, Madison County, Alabama* (Shaw, May 2009) is enclosed for your review/concurrence.

The document has been posted on ActiveProjects for electronic viewing to subscribers as listed on the attached distribution list and in accordance with the Document Submission Requirements and Distribution Procedures (Revision XXXIX). Copies of this document have been forwarded to the recipients listed on the attached distribution list, quantities as indicated.

In accordance with the Draft FFA, concurrence or technical review comments on the subject document are due by June 10, 2009 (7 days). Your cooperation in achieving this date is appreciated.

If you have any questions or need additional information regarding this submittal, please do not hesitate to call me at 865-694-7433.

Respectfully submitted,

Don C. Burton

Don C. Burton, P.E.
Project Manager
Shaw Environmental, Inc.

Distribution

DEPARTMENT OF THE ARMY — 1 hard copy
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Final

Installation-Wide Groundwater Land-Use Control Remedial Design

Redstone Arsenal
Madison County, Alabama
U.S. EPA ID No. AL7 210 020 742

Prepared for:

U.S. Army Corps of Engineers, Savannah District
P.O. Box 889
Savannah, Georgia 31402-0889

Prepared by:

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Knoxville, Tennessee 37923

Delivery Order 0022
Contract Number DACA21-96-D-0018
Shaw Project No. 109774

May 2009

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List of Acronyms

ADEM	Alabama Department of Environmental Management
ARAR	applicable or relevant and appropriate requirement
Army	U.S. Army Garrison – Redstone
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COPC	chemical(s) of potential concern
DWEL	drinking water equivalency level
EPA	U.S. Environmental Protection Agency
IRA	interim remedial action
IRAO	interim remedial action objective
IROD	interim record of decision
IRP	Installation Restoration Program
IWGW	installation-wide groundwater
LUC	land-use control
MCL	maximum contaminant level
µg/L	micrograms per liter
MOA	memorandum of agreement
MSFC	George C. Marshall Space Flight Center
NASA	National Aeronautics and Space Administration
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
OU	operable unit
PRG	preliminary remediation goal
RCRA	Resource Conservation and Recovery Act
RD	remedial design
RI	remedial investigation
ROD	record of decision
RSA	Redstone Arsenal
SAC	site access control
Shaw	Shaw Environmental, Inc.

1.0 Introduction

This land-use control (LUC) remedial design (RD) for installation-wide groundwater (IWGW) is submitted in partial fulfillment of the remedial response process for site cleanup at Redstone Arsenal (RSA). It provides information on how LUCs and the off-post coordination of the remedy selected in the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) interim record of decision (IROD) for IWGW will be implemented and maintained. The U.S. Army Garrison – Redstone (Army) and the National Aeronautics and Space Administration (NASA) are responsible for implementing environmental restoration at RSA and the George C. Marshall Space Flight Center (MSFC), respectively. These facilities are located in Madison County, Alabama (Figure 1). The RSA and NASA/MSFC facilities are undergoing environmental cleanup activities under CERCLA and the Resource Conservation and Recovery Act (RCRA).

RSA is bordered by four local government entities (Figure 1). The city of Huntsville and Madison County surround RSA to the north, east, and west. The city of Madison is adjacent to a very small portion of the northwest corner of RSA. Morgan County lies south of RSA, across the Tennessee River. Additionally, the town of Triana is located approximately one-half mile from the southwestern boundary of RSA.

Currently, there are 113 sites listed under RSA's Installation Restoration Program (IRP) and 9 sites listed in RSA's Military Munitions Response Program being addressed under CERCLA and are included in RSA's RCRA Part B permit. There are 41 sites listed under RSA's Compliance Cleanup Program being addressed under RCRA. The IRP sites are organized into 20 operable units (OU), primarily for administrative purposes for the Administrative Record. Figure 2 shows surface media sites and the 13 groundwater sites at RSA.

During past regulatory reviews of prepared surface media records of decision (ROD), the Alabama Department of Environmental Management (ADEM) indicated to the Army that they would not concur because of the lack of state regulatory enforcement control over the potential exposure route for human receptors who may unknowingly drink the contaminated groundwater under the surface media sites. ADEM's concern is that there may be risks that are not yet identified at the 13 groundwater sites and that while the sites are undergoing characterization, the potential for exposure to human receptors exists. In order to address ADEM concern over exposure to groundwater under the CERCLA surface media sites, the U.S. Environmental

Protection Agency (EPA) Region 4, ADEM, and the Army agreed on June 21-22, 2006 to the following path forward:

- An IROD will be developed to prevent potable use and provide management control over nonpotable uses of all groundwater beneath RSA. (The IROD for IWGW [Shaw Environmental, Inc. (Shaw), 2007] was approved by EPA Region 4 and ADEM in September 2007.)
- An RD will be developed to specify details concerning the implementation of the IWGW interim LUCs.
- The IROD will remain in effect until such time as the final remedies are selected for each groundwater site.
- As final groundwater site RODs are completed, any final LUCs in those RODs will supersede the interim LUCs contained in this IWGW IROD.

This path forward recognizes that an interim remedial action (IRA) may be needed even before enough information can be gathered to prepare final RODs for the groundwater sites. To fill this need, EPA encourages the use of IRAs so that as many remedial action decisions as possible can occur at the earliest point in the site investigations. The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) [§300.430(a)(1)(iii)(D)] recognizes LUCs as alternatives to short-and long-term site management to prevent or limit exposure to hazardous substances, pollutants, or contaminants. Since LUCs are expected to be a component of the final remedy(s) for the groundwater sites, the Army, EPA Region 4, and ADEM agreed to implement LUCs as an IRA for IWGW. By implementing LUCs, the Army plans to protect RSA workers and on-post residents from exposure to RSA groundwater from potable and nonpotable uses. Figure 3 highlights the current step (Step 6, Remedy Implementation) in the RCRA/CERCLA remedial response process for site cleanup.

1.1 Purpose

An IROD was prepared to select a remedy, LUCs, as an IRA for IWGW at RSA. The purpose of the LUC RD is to establish the methods to be taken to assure the long-term effectiveness of LUCs in protecting human health and the environment from exposure to groundwater beneath RSA. The details and responsibilities for implementing, monitoring, and enforcing LUCs are often not clearly defined at the time the controls are formulated.

The LUC RD will be a legally enforceable document that specifies the details of the groundwater LUCs and how they will be implemented, maintained, and reported. Administrative procedures for prohibiting use of groundwater for potable purposes on RSA and for managing groundwater

use for nonpotable purposes are similar to those specified in the current site access control (SAC) program administered by the Army (Army, 2008) (Appendix A). These procedures identify activities on RSA that would involve potential contact with contaminated groundwater and will specify mechanisms to implement the groundwater LUC objectives to protect human health from exposure to contaminated groundwater (including seeps and springs) until final groundwater remedies are selected.

Currently, an SAC program implemented by the Army ensures that groundwater beneath RSA is properly controlled and managed for any current and future potable and nonpotable uses to prevent unacceptable human exposure. The Army, in conjunction with EPA and ADEM, has determined that a legally enforceable IRA is necessary for groundwater, because a preliminary evaluation of chemical concentrations found in groundwater indicates there could be significant risks or hazards to human health should groundwater in some locations be used for potable water purposes before final remedies for the groundwater sites are instituted.

This document is issued by the Army, the lead agency for site activities under CERCLA at RSA. EPA Region 4 and ADEM are the regulatory agencies providing oversight of the Army's cleanup program at RSA. The Army and EPA Region 4 have selected the IRA of LUCs for IWGW, and ADEM concurs.

The LUC implementation and maintenance actions described herein will be effective immediately upon approval of this LUC RD as a primary document by EPA Region 4 and ADEM. The Department of Defense and EPA have established standard requirements to be included in RODs and post-ROD documents in order to ensure adequate implementation of LUCs. These items are tracked by EPA using their *Land Use Control ROD and Post-ROD Checklist*. Item numbers 1 through 9 of this checklist have already been included in the ROD for the IWGW (Shaw, 2007). Items 10 through 19 from the checklist are included in this document in the following sections:

LUC Checklist Item Number	Location in the IWGW LUC RD
10	Section 4.1.4
11	Section 4.1.4
12	Section 4.1.4
13	Section 4.1.7
14	Section 4.1.5
15	Section 4.1.3
16	Section 4.0, paragraph 1
17	Sections 4.1.2 and 4.1.3
18	Section 4.1.7
19	Sections 3.0 and 4.0

1.2 Scope of the Installation-Wide Groundwater Interim Remedial Action

The scope of the problem to be addressed by this IRA is to provide LUCs for IWGW to protect current and future human health prior to implementation of a final groundwater remedy. This includes ensuring that RSA's groundwater is not used for drinking water in the interim and that current and future nonpotable uses of the groundwater, including irrigation, watering livestock, car washing, and encountering groundwater during construction (i.e. digging foundations, basements, pools) are managed to prevent human consumption and to control other types of exposures. Primary exposure pathways include ingestion and absorption. Human health exposure to vapors from volatile organic compounds in groundwater that can migrate into buildings is currently being addressed with the specific surface media sites. In areas outside of surface media sites or where vapor intrusion evaluations have not been performed, they will be performed under the groundwater site investigations. To date, where vapor intrusion evaluations have been performed, there has been no unacceptable risk to human health from vapor intrusion. A decision to not include exposure from vapor intrusion in the IRA was made among risk managers from the Army, EPA, NASA, and ADEM on February 27, 2007.

This LUC RD covers the entire RSA area (fence to fence) with the exception of the NASA/MSFC area (Figure 4). The groundwater under the MSFC portion of RSA is not part of the scope of this document. MSFC is located near the central portion of RSA. Although the groundwater underlying MSFC is technically inseparable from the rest of RSA groundwater, NASA has developed a separate IRA proposed plan and IROD to address similar risks from contaminated groundwater (i.e., OU-3) under its portion of RSA. Thus, implementation of the two IRAs will involve a multiparty decision-making process among the Army, NASA, EPA Region 4, and ADEM. This LUC RD only applies to the groundwater within the control of the Army. The Army does not have authority to enforce LUCs off of RSA.

Groundwater monitoring is being implemented separately in future remedial investigations (RI) for each groundwater and surface media site and in other programs. Additional groundwater monitoring is, therefore, not a component of this IRA. Available data are sufficient to justify the need for interim LUCs to restrict groundwater use and exposures on RSA. Long-term groundwater monitoring of the groundwater sites is anticipated to be part of the final remedy for the groundwater sites.

This action will meet all applicable or relevant and appropriate requirements (ARAR) specifically associated with this IRA. The final action at the groundwater sites in combination with this IRA will either achieve compliance with all ARARs or will provide grounds for

invoking a waiver under §300.430(f)(1)(ii)(C) of the NCP. ARAR compliance for surface water or groundwater will be addressed in the final action for each surface media or groundwater site. The final groundwater RODs will supersede the IWGW IROD.

2.0 Background

RSA is a U.S. Army facility that encompasses approximately 38,300 acres of land, all of which are either owned or controlled by the Army. Development within RSA has largely revolved around the historical need to produce and dispose of conventional and chemical munitions and, more recently, to develop and test missiles and rockets. Chemical wastes have been produced by these processes since operations began in the early 1940s. RSA consists of the Wheeler National Wildlife Refuge, operated by the U.S. Fish and Wildlife Service, to the south; industrial areas in the southeast; administrative facilities at the NASA's MSFC in the central portion; and family housing and commercial, recreational, and medical centers in the north portion. The Tennessee Valley Authority owns land to the south, along the Tennessee River. Missile/rocket ranges are present in the western portion of RSA. The mission-related land use in the southern portion of Redstone Arsenal primarily consists of missile/rocket testing and munitions storage, along with the associated range fans, test area safety fans, and explosive safety-quantity distance arcs.

The primary mission of RSA is the development, acquisition, testing, fielding, and sustainment of aviation and missile weapon systems. Most of the RSA tenants support the aviation and missile weapon system effort. RSA is also home to other activities, such as handling explosives and ordnance devices, Defense Intelligence Agency activities, and the production of iron carbonyl.

Summary of Risks Necessitating Land-Use Controls. A streamlined risk evaluation has been performed in support of the IWGW IRA to demonstrate that there is a potential for unacceptable risk to human receptors from exposure to contaminants in groundwater if exposure to groundwater is not prevented or managed. This streamlined risk evaluation applied an approach recommended by EPA Region 4 for use at both RSA and MSFC for this IRA and for other groundwater-related IRAs that are being performed at MSFC. In this streamlined human health risk evaluation, maximum groundwater concentrations were compared to EPA Region 9 preliminary remediation goals (PRG) for tap water (EPA, 2004) and to maximum contaminant levels (MCL) (EPA, 2006).

Perchlorate has been identified as one of the Army's emerging contaminants of concern in groundwater at RSA (Shaw, 2007). EPA has developed a drinking water equivalency level

(DWEL) of 24.5 micrograms per liter (µg/L) for perchlorate. A DWEL, which assumes that all of a contaminant comes from drinking water, is the concentration of a contaminant in drinking water that will have no adverse effect with a margin of safety. Because there is a margin of safety built into the DWEL and into the toxicity values used to develop DWELs, exposure to groundwater concentrations greater than the DWEL may also result in no adverse health effects. The Army uses a similar health-based screening value for perchlorate equal to 24 µg/L. In this streamlined risk evaluation, groundwater concentrations have been compared to the EPA DWEL for perchlorate to demonstrate that a potential for risk exists should exposure to this chemical in groundwater occur.

Concentrations of contaminants in groundwater were found to exceed PRGs or MCLs in all 13 groundwater sites (Shaw, 2007). While EPA Region 9 guidance on PRGs specifies that these values are not *de facto* cleanup standards and should not be applied as such, exceedances of PRGs demonstrate that a potential for unacceptable risks exists. The magnitude and extent of this potential risk cannot be determined from this evaluation. However, some groundwater sites have significant concentrations of volatile organic compounds occurring over large areas.

The screening evaluation of risk demonstrates that chemicals of potential concern (COPC) are present at all groundwater sites on RSA. For most sites, groundwater may pose carcinogenic risks or result in adverse noncarcinogenic health effects to human receptors should the groundwater be used for potable purposes. The contaminated groundwater under RSA is considered by ADEM to be potentially usable, but it is not currently used as potable drinking water. Uncontrolled current or future use of this groundwater for potable or nonpotable purposes may potentially pose unacceptable risks to human receptors that may contact or ingest this medium. The comparison of groundwater concentrations to PRGs or MCLs demonstrates that RSA groundwater concentrations exceed, sometimes greatly, these health-based criteria or promulgated standards. The results of this comparison support the need for implementing an IRA until final remedies are selected for the groundwater sites. Groundwater sites will undergo a comprehensive quantitative human health risk assessment in the RI efforts associated with each site.

Throughout RSA, groundwater occurs at depths ranging from the surface (where seeps or springs exist) to 30 to 35 feet below ground surface (bgs). Because the groundwater at depth is currently not used as a potable water source, there are only limited potential human health exposures, and ecological receptors are not exposed to subsurface groundwater. However, groundwater does discharge to surface water at numerous springs and seeps that present both human health and ecological exposure points. An evaluation of risks posed by groundwater to ecological receptors

is not part of the scope of the IWGW IRA. However, the Army is currently conducting an evaluation of the integrator OUs, which will address the potential risks resulting from contaminated groundwater contributing to surface water and wetland systems (Shaw, 2009).

This risk evaluation reveals that groundwater users potentially exposed to COPCs via the ingestion exposure pathway may have unacceptable human health exposure. Thus, if the IRA is not implemented, there may be substantial endangerment to public health and welfare.

3.0 Land-Use Control Objectives

The LUCs that have been selected involve legal and administrative actions by the Army to control groundwater use under RSA and to coordinate with the local government entities so that informed decisions can be made by these entities for off-post use of groundwater impacted by RSA. The following LUC objectives have been established to meet the interim remedial action objectives (IRAO).

- Prohibit the use of groundwater at RSA (including seeps and springs) for drinking water purposes.
- Control the use of RSA groundwater for nonpotable uses in support of the Army's mission.
- Initiate formal coordination with local government agencies who may conduct activities on or off RSA involving potentially contaminated groundwater where the Army is not in control of the action. This objective is to allow consistent review and input by the Army of pending groundwater actions to protect human health.

These three objectives were negotiated with EPA and ADEM and included in the final installation-wide groundwater IROD (Shaw, 2007). Specifically, the intent of the first objective is to address threats to workers, visitors, and recreational receptors from using groundwater for potable purposes. This includes preventing ingestion of groundwater which has daylighted into seeps and springs on the Arsenal. The intent of the second objective is to eliminate as much as possible the threats from nonpotable exposures to groundwater, either through nonpotable uses (such as lawn watering) or from exposure to groundwater during work activities. The intent of the third objective is to prevent exposure to offsite residents, workers, and groundwater users from Army-related contaminants in off site groundwater. The action to be taken to achieve this third objective will be to initiate formal coordination with local governments as discussed in Section 4.2.

During development of this LUC RD, other exposure routes to potentially contaminated groundwater were identified (see Section 4.1.1). Thus, a fourth LUC objective has been identified:

- Eliminate threats to site workers from inadvertent exposure to contaminated groundwater from both direct and indirect pathways. This exposure may occur either as a result of nonpotable groundwater use or from exposure to groundwater during work activities such as construction or maintenance of sumps.

These IRAOs provide exposure control for on-post and off-post workers and residents currently and in the future. The purpose of this IRA is to prevent, control, or manage exposure from potable or nonpotable uses of potentially contaminated groundwater under RSA so that the risks to human health are eliminated or minimized until final remedies for groundwater are in place. No preliminary cleanup goals are warranted as part of the IRA, because the scope is to provide controls for groundwater use and eliminate or minimize exposure. The action does not involve active contaminant remediation or contaminant plume containment. The IRA will not result in contaminant reduction but provides current and future protection for human health through administrative and legal controls. Since the IRA leaves waste in place at levels that do not allow for unrestricted use and unlimited exposure, CERCLA five-year reviews will be required.

Currently, the SAC program administered by the Army enforces a work order review process that prohibits the installation of wells for water uses including consumption, industrial processes, and agricultural purposes, if it is determined that these water uses will not be protective of human health (Army, 2008). In addition, the SAC program contains a number of provisions which ensure that human protection from nonpotable uses of groundwater is provided. For example, requests for proposed activities that may encounter or withdraw groundwater for nonpotable uses, including but not limited to new construction and remediation-based projects, irrigation, and maintenance activities, are reviewed and approved in accordance with RSA Regulation 200-7, included as Appendix A.

The government entities bordering RSA are Madison County, the cities of Madison and Huntsville, and Morgan County (Figure 1). The town of Triana is located approximately one-half mile from the western boundary of RSA and is included in formal coordination activities as well (Figure 1). On RSA, government entities include the Tennessee Valley Authority and the Wheeler National Wildlife Refuge. NASA will implement its own remedy for groundwater under MSFC.

State laws and regulations or city ordinances for government entities adjacent to RSA have provisions requiring that drilling applications or permits be filed with either city, county, or state government entities before water wells are drilled. Applications or permits are also required for many other activities where groundwater might be encountered or become available for people to contact, such as the construction of a pond or installation of a swimming pool. Table 1 presents a summary of the state regulations and city ordinances currently in place which require that drilling applications or permits be obtained prior to any well drilling. Formal Army coordination through administrative mechanisms, including memoranda of agreement, with these adjoining government agencies as well as other government entities on the Arsenal, including the U.S. Fish and Wildlife Service-Wheeler National Wildlife Refuge and the Tennessee Valley Authority, have been developed as part of the administrative controls to ensure that installation of new drinking and non-drinking water wells is protective of the community and that off-post groundwater contamination originating from Redstone Arsenal is considered during other permitted construction activities as well (Appendices B through D).

A formal coordination process is being developed with adjacent government entities to enable the Army to provide information and assistance during governmental review of applications for well installation or other construction activities where groundwater may be encountered. The intent of the coordination is to prevent or minimize potential exposure of off-post residents or workers to contaminated groundwater in addition to preventing further migration of the RSA plume off post. A memorandum of agreement (MOA) (Appendices B, C, and D) documents the coordination process between RSA and government agencies.

4.0 Land-Use Controls

This section provides a comprehensive list of LUCs and the internal procedures to be used to implement the LUCs. LUCs included in this section will be implemented prior to any land transfer that RSA may undertake.

4.1 Site Use and Access Restrictions

The Army has an established system for accessing all environmental sites at RSA. The Army controls these sites to prevent any activities that might expose someone to site contamination or other hazardous conditions. The process is outlined in Army Regulation 200-7 (the RSA SAC program, Appendix A) and is applicable to the primary command and tenants of RSA. The SAC program will be used to implement the LUCs. The existing procedure uses an information management system, work request process, and review-and-approval procedures. A variety of

administrative controls have been implemented to minimize the occurrence of unapproved and potentially harmful activities. The program allows the determination of acceptable solutions for performing proposed activities on environmental sites in order to maintain a high level of operational readiness for RSA's missions. The Army will notify EPA and ADEM in advance of any changes to internal procedures for implementing LUCs.

4.1.1 Exposure Analyses for On-Post Workers

As noted above, groundwater at RSA is not used as a potable source, and the SAC program prohibits its use as a potable source in the future. However, worker exposure to groundwater not developed as a potable source is plausible. Site access requests involving exposure to groundwater are reviewed to determine which site controls are required to ensure worker safety from exposure to hazardous materials. The review involves the evaluation of the location to which access is requested and nature of exposure to groundwater associated with the type of activity to be performed. Several scenarios have been identified in which workers may be exposed to groundwater. Several exposure scenarios were determined to not warrant consideration under the SAC program because other mandated health and safety programs already provide worker protection, including the following:

- Exposure to investigation-derived waste or discharge from the groundwater treatment system. Exposure is expected to be short term, potentially involving dermal contact. Inhalation of airborne volatiles is also a plausible pathway, but native air currents and the large volume of ambient air are expected to reduce airborne concentrations to toxicologically insignificant levels.

- Site exploration or drilling for hydropunch sampling, monitoring well installation, or geotechnical sampling. Exposure is expected to be short term, potentially involving dermal contact. Inhalation of airborne volatiles is also a plausible pathway but is unlikely to be significant, as explained in the first bullet above.

- Sampling existing monitoring wells. Exposure is expected to be short term, potentially involving dermal contact. Inhalation of airborne volatiles is also a plausible pathway but is unlikely to be significant, as explained in the first bullet above.

The following exposure scenarios are not considered to be of concern because exposure time and duration during the activity would be too short for adverse health impacts to occur:

- Groundwater withdrawn for irrigation and lavatory operation. Exposure is expected to be very short term, potentially involving dermal contact during use or servicing of facilities. Inhalation of airborne volatiles is also a plausible pathway but is unlikely to be significant, as explained in the first bullet above.

- Groundwater withdrawn for vehicle washing. Exposure is expected to be very short term, potentially involving dermal contact during use or servicing of facilities. Inhalation of airborne volatiles is also a plausible pathway but is unlikely to be significant, as explained in the first bullet on Page 9.

- Groundwater withdrawn to troughs for watering grazing cattle. Human exposure is expected to be very short term, potentially involving dermal contact during setup or servicing of the system. Inhalation of airborne volatiles is unlikely to be significant, as explained above. Volatiles in groundwater are not bioaccumulative and do not represent a source of exposure to humans through the food chain pathway.

The following exposure scenarios have the potential for resulting in worker exposure to groundwater contaminants at a magnitude, duration, and frequency where worker protection should be considered:

- Exposure to well water from existing potable wells while working.

- Exposure to springs while performing maintenance activities or while engaging in on-post recreation.

- Exposure to shallow groundwater up to 15 feet bgs during invasive activities to install or service utilities and to remove or install footers or foundations during building demolition or construction. Exposure is expected to be short term, potentially involving dermal contact. Inhalation of airborne volatiles may be significant, because vapors may accumulate in a pit or trench.

- Exposure to groundwater up to 15 feet bgs to bedrock to install certain facilities, footers, or supports for larger structures. Exposure is expected to be short term, potentially involving dermal contact. Inhalation of airborne volatiles may be significant, because vapors may accumulate in a pit.

- Exposure to sumps containing groundwater inside buildings that are visited by workers during invasive activities to install or service utilities. Dermal exposure during installation or service of sump equipment is expected to be short term. Inhalation exposure to airborne volatiles may be significant, because vapors may accumulate in sumps.

The specific LUCs to be implemented through enhancements to RSA's SAC program have been developed to prevent or minimize exposure when workers are engaged in the activities listed above.

4.1.2 Site Access Control Program Enhancements

This section presents a comprehensive list of the LUCs that will be implemented through enhancements to the existing SAC program. The current SAC program provides the necessary physical, legal, and administrative controls to comply with the objectives of the IWGW LUCs (Section 3.0). The primary components of the SAC program that are applicable to the IWGW LUC are as follows:

- Review job order requests for construction and maintenance activities to ensure worker safety.
- Ensure no wells are installed on RSA for drinking water purposes.
- Install and maintain engineering controls such as fencing and warning signs.
- Provide educational materials to raise awareness of control measures.

The current SAC program will be used to monitor and enforce the LUCs, with the following enhancements to ensure the health and safety of workers and visitors on RSA who may be exposed to potentially contaminated groundwater:

- The current SAC program will be revised to state that installation of wells to provide water for human consumption, industrial processes, and agricultural purposes is prohibited. Additionally, the process for reviewing and approving the use of groundwater for nonpotable uses (such as irrigation and vehicle washing) will be added to the SAC program.
- Wells with the potential for potable use have been identified on post. Warning signs at these wells have been posted and will be maintained. The signs state "NOTICE, NON-POTABLE WATER NOT FOR DRINKING OR COOKING USE." Table 2 presents a listing of potable wells located on Redstone Arsenal and Figure 5 shows their locations.
- Warning signs have been posted at select springs on RSA. These springs were selected based on the concentration of contaminants observed in the spring, on accessibility, and on the magnitude of spring flow. The signs state "NOTICE, CONTAMINATED GROUNDWATER SPRING LOCATED NEARBY. WATER NOT SUITABLE FOR DRINKING." Springs that have been posted are listed in Table 3 and shown on Figure 5.
- Educational materials will be prepared and distributed to supervisors and workers to increase awareness of the IWGW LUCs. This educational effort will target personnel who manage key public works such as utilities, groundskeeping, construction projects, and base master planning.

- The existing LUC database will be modified to track this LUC as well as others at RSA. This database lists the project controls needed to manage the LUCs, including Geographic Information System maps.

- When job order requests are received for construction and maintenance projects, these requests will be reviewed to determine whether workers may encounter contaminated groundwater. For projects where workers may encounter groundwater, a determination will be made of the need for health and safety precautions. Appropriate health and safety staff will identify measures that need to be taken.

- The SAC program will annually review and revise the IRP/Military Munitions Response Program work plan evaluation checklist, which is used to review and approve job orders and service requests, to ensure that the review has evaluated the potential exposures outlined in Section 4.1.1 (Appendix A).

- The SAC program will update maps and materials provided at the outdoor recreation office for visitors to RSA for hunting, fishing, and other recreation to state the restrictions and warnings associated with these LUCs.

4.1.3 Land-Use Control Monitoring and Reporting

RSA Regulation 200-7 provides that all entry onto environmental sites or activities adjacent to these sites which may impact the current or future contaminant nature, extent, or migration must be controlled and managed to ensure compliance with all applicable post, state, and federal environmental regulations. Monitoring of the environmental use restrictions and controls will be conducted annually by the Army. The monitoring results will be included in a separate report or as a section of another environmental report, if appropriate, and provided to EPA and ADEM. The annual monitoring reports will be used in preparation of the five-year review to evaluate the effectiveness of the remedy. An Installation-Wide Groundwater Land-Use Control Interim Remedial Action Inspection Checklist, presented in Appendix E, will be used to monitor and report these LUCs.

The annual monitoring report submitted to the regulatory agencies by the Army will evaluate the status of the LUCs and how any LUC deficiencies or inconsistent uses have been addressed. The annual evaluation will address whether the use restrictions and controls referenced previously were communicated in the deed(s), whether the owners and state and local agencies were notified of the use restrictions and controls affecting the property, and whether use of the property has conformed to such restrictions and controls. The report will include a copy of the annual inspection, any violations noted, and recommendations for any changes to the LUCs.

4.1.4 Land-Use Control Enforcement and Notification of Action(s) Interfering with Land-Use Control Effectiveness

The Army will work with EPA, ADEM, and if applicable, transferees/lessees of the property, to take appropriate action to enforce the LUCs or maintain remedy integrity. The Army is not precluded from taking immediate action pursuant to its CERCLA authorities to prevent any perceived risk(s) to human health or the environment. Any violations that breach federal, state, or local criminal or civil law will be reported to the appropriate civil authorities. These measures may range from informal resolutions with the owner or violator to the institution of judicial action under the auspices of state property law or CERCLA.

Any activity that is inconsistent with the LUC objectives or use restrictions, or any other action that may interfere with the effectiveness of the LUCs, will be addressed by the Army as soon as practicable, but in no case will the process be initiated later than 10 days after the Army becomes aware of a breach.

The Army will notify EPA and ADEM as soon a practicable but no longer than 10 days after discovery of any activity that is inconsistent with the LUC objectives or use restrictions, or any other action that may interfere with the effectiveness of the LUCs. The Army will notify EPA and ADEM regarding how the Army has addressed or will address the breach within 10 days of sending EPA and ADEM notification of the breach. In addition, the Army shall notify EPA and ADEM 45 days in advance of any proposed land use changes that are inconsistent with LUC objectives or the selected IRA.

4.1.5 Duration, Modification, and Termination of Land-Use Controls

LUCs will be maintained until the concentrations of hazardous substances in site groundwater are at such levels to allow for unrestricted use and exposure. The Army shall not modify or terminate LUCs or implementation actions or modify land use without approval by EPA and ADEM. The Army shall seek prior concurrence before any anticipated action that may disrupt the effectiveness of the LUCs or any action that may alter or negate the need for LUCs. Changes to LUCs will be addressed by submitting addenda to this LUC RD.

4.1.6 CERCLA Five-Year Reviews

A five-year review is required by CERCLA when hazardous substances, pollutants, or contaminants are above levels that allow for unlimited use and unrestricted exposure. These reviews provide an opportunity for the responsible party and regulators to evaluate the implementation and performance of a remedy to determine whether it remains protective of human health and the environment. In accordance with the CERCLA Section 121(c), a five-year

remedy review will be performed by the Army to ascertain the continued effectiveness of the remedy and to verify the integrity of the LUCs (e.g., land use still consistent with the use restrictions, required signs and fences still in place).

The Army will verify that the LUCs continue to be properly recorded and/or maintained by the responsible agency or entity. Each remedy review will evaluate whether site conditions or risk levels have changed due to contaminant attenuation, migration, or other factors (e.g., land use). A change in site conditions or risk will result in a re-evaluation of LUCs and recommendations for modifications to the existing LUCs. Five-year reviews will continue until contaminants are below levels that allow for unrestricted use for all sites, as determined by the Army.

4.1.7 Property Transfers and Leases

The Army will provide notice to EPA and ADEM at least six months prior to any transfer or sale of the area of the facility covered by the IROD so that EPA and ADEM can be involved in discussions to ensure that appropriate provisions are included in the transfer terms or conveyance documents to maintain effective LUCs. If it is not possible for the facility to notify EPA and ADEM at least six months prior to any transfer or sale, then the facility will notify EPA and ADEM as soon as possible but no later than 60 days prior to the transfer or sale of any property subject to LUCs. In addition to the land transfer notice and discussion provisions above, the Army further agrees to provide EPA and ADEM with similar notice, within the same time frames, as to federal-to-federal transfer of property. The Army shall provide a copy of executed deed or transfer assembly to EPA and ADEM.

Each transfer of fee title from the United States will include a CERCLA 120(h)(3) covenant which will have a description of the residual contamination in the groundwater under the property and the environmental use restrictions, expressly prohibiting activities inconsistent with the performance measure goals and objectives.

The environmental restrictions are included in a section of the CERCLA 120(h)(3) covenant that the United States is required to include in the deed for any property known to have had hazardous substances stored for one year or more, released, or disposed of on the property. Each deed will also contain a reservation of access to the property for the Army, EPA, and ADEM, and their respective officials, agents, employees, contractors, and subcontractors for purposes consistent with the Army IRP or the Federal Facility Agreement, if one is in effect. The deed will contain appropriate provisions to ensure that the restrictions continue to run with the land and are enforceable by the Army.

During the time between the adoption of the IROD and deeding of the property, equivalent restrictions are being implemented by lease terms, which are no less restrictive than the use restrictions and controls described above, in the IROD (Shaw, 2007). These lease terms shall remain in place until the property is transferred by deed, at which time they will be superseded by the LUCs described in the IROD.

Concurrent with the transfer of fee title from the Army to transferee, information regarding the environmental use restrictions and controls will be communicated in writing to the property owners and to appropriate state and local agencies to ensure such agencies can factor such conditions into their oversight and decision-making activities regarding the property.

If the transferee or lessee wants to conduct additional remediation, change land use inconsistent with a deed or lease restriction, or modify or terminate a LUC, the transferee or lessee must first obtain written concurrence from the Army, EPA, and ADEM.

4.2 Off-Post Coordination Process

In order to prevent or minimize potential exposure of off-post residents or workers to contaminated groundwater that may migrate from under the RSA boundary, a formal coordination process, such as an MOA, with adjacent government entities has been developed. The Army has historically interfaced with these government entities on an informal basis over groundwater contamination issues, including reviews of well permits. RSA staff has met with local officials, contractors, and developers; participated in town meetings; and provided resource materials such as contaminant plume maps to assist in preventing inadvertent contact with contaminated groundwater.

The following sections present the adjacent communities, outline the key points in the MOAs, determine the reporting process for compliance with the MOAs, and discuss the notification process for actions interfering with the effectiveness of the MOAs.

4.2.1 Identification of Adjacent Government Entities

RSA is bordered by five local government entities, as shown on Figure 1. The city of Huntsville and Madison County surround RSA to the north, east, and west. The city of Madison is adjacent to a very small portion of the northwest corner of RSA. Morgan County lies south of RSA, across the Tennessee River. Additionally, the town of Triana is located approximately one-half mile from the southwestern boundary of RSA.

4.2.2 Development of MOAs

The MOAs are intended to facilitate cooperative implementation of the administrative controls to ensure that off-post installation of new drinking and nondrinking water wells, or construction activities that may encounter groundwater is protective of the community. Three MOAs have been developed between the Army and each surrounding government entity. The city of Madison, the town of Triana, and Madison County will be part of the same MOA because they all must go through the Madison County permitting process for well installation. The following appendices contain the MOAs between the Army and adjacent government entities:

- Appendix B – City of Huntsville
- Appendix C – Madison County (including the city of Madison and the town of Triana)
- Appendix D – Morgan County.

These agreements will be entered into on the date of the last approving signature by the government entity and the Army. Changes to the agreements will warrant approving signatures from all parties involved and will be reissued as a revised appendix to this document. The points of contacts for each party as well as ADEM and the EPA are listed in Section 5.0.

4.2.3 Compliance Reporting

The Army at RSA will provide an annual summary report of permit reviews that were required because of the process outlined in the MOA. This summary report will be provided to all parties involved.

4.2.4 Notification of Action(s) Interfering with MOA Effectiveness

In the event that any party involved in the MOA becomes aware of an action interfering with the effectiveness of the MOA (for example, a well is installed without an approved permit), that party will notify the other parties. The governing agency will pursue the violation in accordance with the regulation.

5.0 Points of Contact

Terry de la Paz
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U.S. Army Garrison - Redstone
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Redstone Arsenal, Alabama 35898
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Atlanta, Georgia 36110-34013
Telephone: (404) 562-8526

Philip Stroud, Remedial Project Manager
Alabama Department of Environmental Management
Hazardous Waste Branch, Land Division
1400 Coliseum Boulevard
Montgomery, Alabama 36130-1463
Telephone: (334) 270-5684

Mr. Dwight Cooley
Wheeler National Wildlife Refuge
U.S. Fish and Wildlife Service
2700 Refuge HQ Road
Decatur, Alabama 35603
Telephone: (256) 353-7243

Mr. Randy McCann
Tennessee Valley Authority
Pickwick/Wheeler Watershed Team
P.S. Box 1010, SB-1H-M
Muscle Shoals, Alabama 35662-1010
Telephone: (256) 386-2568

City of Huntsville
Tony Owens – Huntsville Utilities Water Manager
112 Spragins Street, NW
Huntsville, AL 35801
Telephone: (256) 535-1410
http://www.hsvcity.com/publications.php

City of Madison
Madison Water & Wastewater Board
Ricky Pounders, General Manager
101 Ray Sanderson Drive
Madison, AL 35758
Telephone: (256) 461-0844

Madison County Water Department
Fritz Mucke, Director
266B Shields Road
Huntsville, AL 35801

Telephone: (256) 746-2888

Huntsville-Madison County
Health Department
Tom Jenson
301 Max Luther Drive
Huntsville, AL 35811
Telephone: (256) 533-8732

Morgan County Health Department
510 Cherry Street, NE
Decatur, AL 35601-1969
Telephone: (256) 353-7021

Triana
Administrative Offices
Tony Olanzo
640 6th Street
Madison, AL 35756
Telephone: (256) 772-0151

6.0 References

Shaw Environmental, Inc. (Shaw), 2009, Draft Final Redstone Arsenal Integrator Operable Unit Protocol Report of Findings, Redstone Arsenal, Madison County, Alabama, prepared for U.S. Army Corps of Engineers, Savannah District, May.

Shaw Environmental, Inc. (Shaw), 2007, ***Final Interim Record of Decision, Interim Remedial Action for Installation-Wide Groundwater, Redstone Arsenal, Madison County, Alabama,*** prepared for the U.S. Army Corps of Engineers, Savannah District, September.

U.S. Army Garrison – Redstone (Army), 2008, ***Redstone Arsenal Environmental Site Access Control Program,*** Redstone Arsenal Regulation 200-7, February.

U.S. Environmental Protection Agency (EPA), 2006, ***2006 Edition of the Drinking Water Standards and Health Advisories***, Office of Water, Washington, District of Columbia, EPA 822-R-06-013, Summer.

U.S. Environmental Protection Agency (EPA), 2004, ***Region 9 Preliminary Remediation Goal Table***, San Francisco, California, October.

TABLES

Table 1

Enforcement Authority for Water Well Installation and Water Well Quality for Local Government Entities Redstone Arsenal, Madison County, Alabama

Governmental Organization	Ordinance, Regulation or Law	Provision of Ordinance, Regulation or Law	Permit or Application Process Description
City of Huntsville	City of Huntsville Code Chapter 12, Article VII, Division 2, Section 12-432	A permit must be submitted before drilling any well within city limits.	Permits are submitted to the City for review of well installation. Other activities such as installation of pools or ponds are reviewed as well.
City of Madison	Madison City Code Section 13-170	The city uses the Madison County application but provides approval.	The process is initiated by submitting the Madison County permit. The city will review and provide approval based on the County Health Department's review and approval.
Town of Triana	See Madison County	See Madison County	Any request for a well is managed through Madison County.
Madison County	Legal basis provided under State laws governing well installation and public health laws. See laws and regulations listed under the State of Alabama.	An application is required.	Madison County has a permitting process for all well installations. This process is administered through the County Health Department. The Health Department performs site visits and approvals.
Morgan County	Legal basis provided under State laws governing well installation and public health laws.	Morgan County does not have a permitting or approval process for well installation. Refer to the State requirements.	Review function is performed by the State though health provisions are administered through the County Health Department.
State of Alabama- ADEM	Installation of Water Wells State Law (SL) 22-24 Regulations provided in Code of Alabama Regulations (CAR) 335-9	Wells must be installed by a licensed driller (SL 22-24-8(1)) -Notification of Intent to drill and Certification of Completion must be filed with the state (SL 22-24-8(3)) -State is required to notify the local health authorities after completion (SL 22-24-8(4)) -There are stipulated penalties for not complying -State has the authority to enforce this law (SL 22-24-3) -Regulations for well drilling and construction are provided in CAR 335-9	An Intent to Drill form and a Certification of Completion form must be submitted to ADEM and if requested to the Alabama Geological Survey.

Table 1

Enforcement Authority for Water Well Installation and Water Well Quality for Local Government Entities
Redstone Arsenal, Madison County, Alabama

Governmental Organization	Ordinance, Regulation or Law	Provision of Ordinance, Regulation or Law	Permit or Application Process Description
State of Alabama- State Board of Health	Control of Well Water Quality— See Title 22	The State Board of Health and, as delegated to the County Boards of Health (or district if 2 or more counties join in a district), have the authority to inspect and abate "sources of supply and conveyances of drinking water."	Review, inspection, and enforcement are enacted at the local level by the County Health Department. In accordance with State law, enforcement of health standards can only occur by the State or County boards of health and their staff. Municipalities may not hire municipal health officers (SL 22-1-3)

Table 2

Potable Well Summary
Installation-Wide Groundwater Land-Use Control Remedial Design
Redstone Arsenal, Madison County, Alabama

Well	Other Identification	Condition	Easting	Northing	Description of Use and Control Measures
MC-PWBK-001	None	In Use	407,007	1,528,903	Well feeds golf course irrigation pond north of Goss Road. Pond and well will be posted with signs warning workers not to consume water from the well or pond.
MC-PWBK-002	Z-RS1142	In Use	405,704	1,529,064	Well feeds golf course irrigation pond north of Goss Road. Pond and well will be posted with signs warning workers not to consume water from the well or pond.
U-RS1599	None	In Use	404,567	1,524,852	Well feeds golf course irrigation pond south of Goss Road. Pond and well will be posted with signs warning workers not to consume water from the well or pond.
U-RS1600	P-24	In Use	394,154	1,519,867	Well is used in a remote restroom in the range TA-3 area. Warning signs have been posted informing workers not to consume water from this tap.
U-RS1601	None	Not In Use	397,863	1,527,663	Unused well 90 feet northeast of former Building 6109 is capped and locked. There is no pump in the well and no electrical power service, but it will be posted with a sign warning workers not to consume water from this well.
W-RS1602	Bldg 6302	Not In Use	396,164	1,508,952	Located in well house which is locked. No power is connected to building. If well could be used in the future, it will be posted with a sign warning workers not to consume water from this well.
G-RS1603	Q-209	In Use	423,510	1,513,786	Well is used in a restroom at Gate 1 located on Martin Road. Warning signs have been posted informing workers and restroom visitors not to consume water from this tap.

NOTE: Coordinates (easting and northing) reported in reference to the North American Datum of 1983 (NAD83), using the Continental United States Datum and the Alabama East State Plane.

Table 3

Summary of Springs to Post with Warning Signs
Installation-Wide Groundwater Land-Use Control
Remedial Design
Redstone Arsenal, Madison County, Alabama

Spring ID	Geographical Location	Place Where Sign Will Be Posted
RSP-0759a	West of southern portion of MSFC	At closest road access
RSP-0760	West of southern portion of MSFC	At closest road access
RSP-0766b	West of southern portion of MSFC	At closest road access
RSP-0768a	West of southern portion of MSFC	At closest road access
RSP-0772a	West of southern portion of MSFC	At closest road access
RSP-0780	West of southern portion of MSFC	At closest road access
RSP-0780a	West of southern portion of MSFC	At closest road access
RSP-0824a	Huntsville Spring Branch south of MSFC	At closest road access
RSP-0830	Huntsville Spring Branch south of MSFC	At closest road access
RSP-0986a	Huntsville Spring Branch south of MSFC	At closest road access
RSP-1008	Huntsville Spring Branch south of MSFC	At closest road access
RSP-1026	Huntsville Spring Branch south of MSFC	At closest road access
RSP-1067	DDT Abatement Area	Along roadway between RSA-010 and RSA-053
RSP-1068	DDT Abatement Area	Along roadway between RSA-010 and RSA-053
RSP-1070a	DDT Abatement Area	Along roadway between RSA-010 and RSA-053
RSP-1071	DDT Abatement Area	Along roadway between RSA-010 and RSA-053
RSP-1078a	DDT Abatement Area	Along roadway between RSA-010 and RSA-053
RSP-1086a	DDT Abatement Area	Along roadway between RSA-010 and RSA-053
RSP-1088a	DDT Abatement Area	Along roadway between RSA-010 and RSA-053
RSP-1088b	DDT Abatement Area	Along roadway between RSA-010 and RSA-053
RSP-1090	DDT Abatement Area	Along roadway between RSA-010 and RSA-053
RSP-1126	DDT Abatement Area	Along roadway between RSA-010 and RSA-053
RSP-1195	DDT Abatement Area	Along roadway between RSA-010 and RSA-053
RSP-0890	North of RSA-013 and active OB/OD area	Post at the pond edge near spring
RSP-1702a	McDonald Creek	Post at Hansen Road Bridge
RSP-1720	McDonald Creek	Post at Hansen Road Bridge
RSP-1744a	McDonald Creek	Post at Hansen Road Bridge
RSP-1768	McDonald Creek	Post at Hansen Road Bridge
RSP-1772	McDonald Creek	Post at Hansen Road Bridge
RSP-1796	McDonald Creek	Post at Hansen Road Bridge
RSP-1802	In north central area of site RSA-146	Post at the pond edge near spring
RSP-1802a	In north central area of site RSA-146	Post at the pond edge near spring
RSP-2205	Southeastern Boundary Stream	Posted along Southeast Boundary Stream
RSP-2207	Southeastern Boundary Stream	Posted along Southeast Boundary Stream
RSP-2211	Southeastern Boundary Stream	Posted along Southeast Boundary Stream
RSP-2214	Southeastern Boundary Stream	Posted along Southeast Boundary Stream
RSP-2300	Southeastern Boundary Stream	Posted along Southeast Boundary Stream
RSP-2326	Southeastern Boundary Stream	Posted along Southeast Boundary Stream
RSP-2116	Thiokol Pond	Post sign at pond boundary
RSP-2128	Thiokol Pond	Post sign at pond boundary
RSP-2140	Pond south of RSA-096	Post sign at pond boundary

MSFC - Marshall Space Flight Center.
OB/OD- Open Burn/Open Detonation.
DDT - Dichlorodiphenyltrichloroethane.

FIGURES

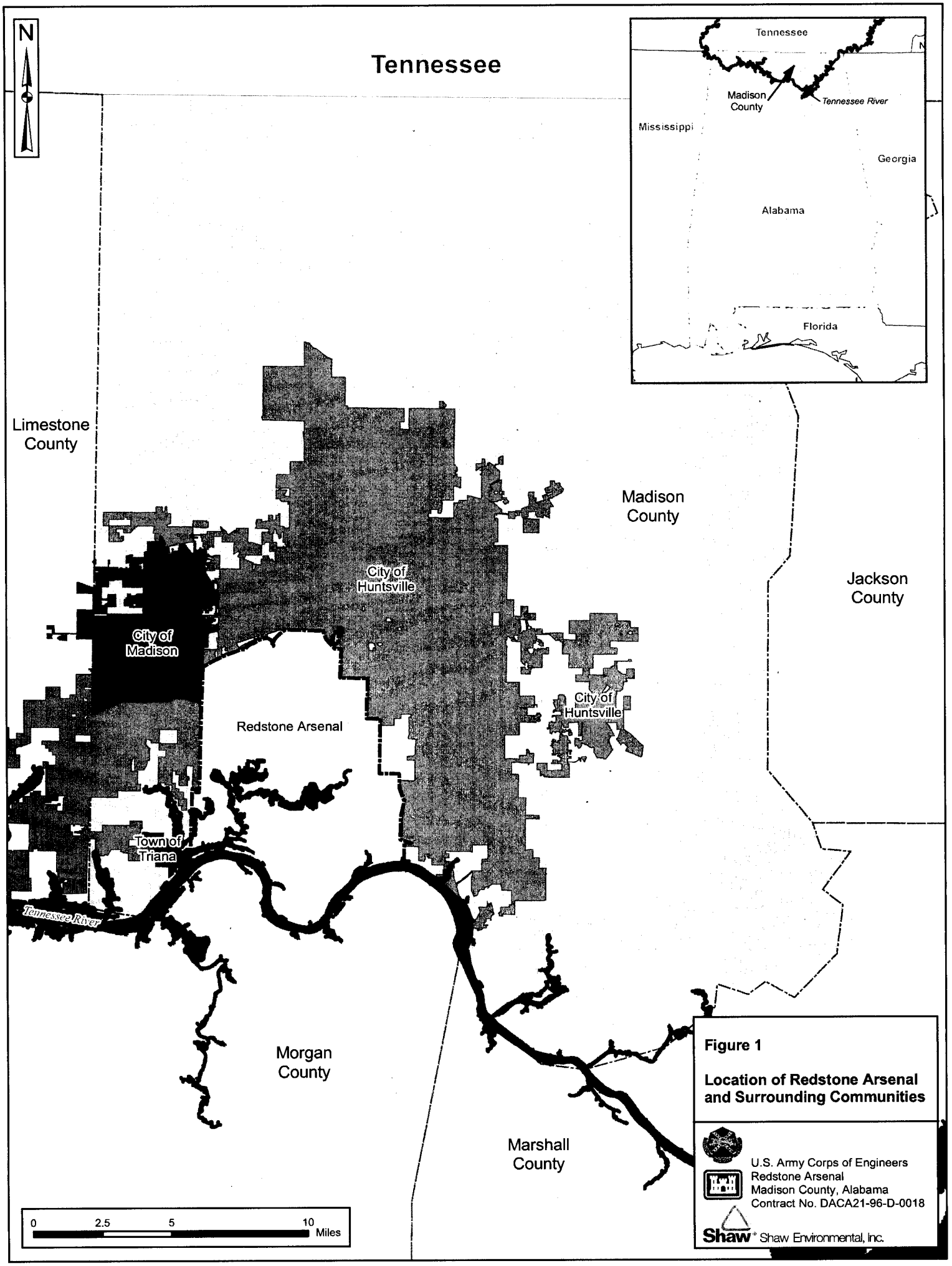

Figure 1

Location of Redstone Arsenal and Surrounding Communities

U.S. Army Corps of Engineers
Redstone Arsenal
Madison County, Alabama
Contract No. DACA21-96-D-0018

Shaw® Shaw Environmental, Inc.

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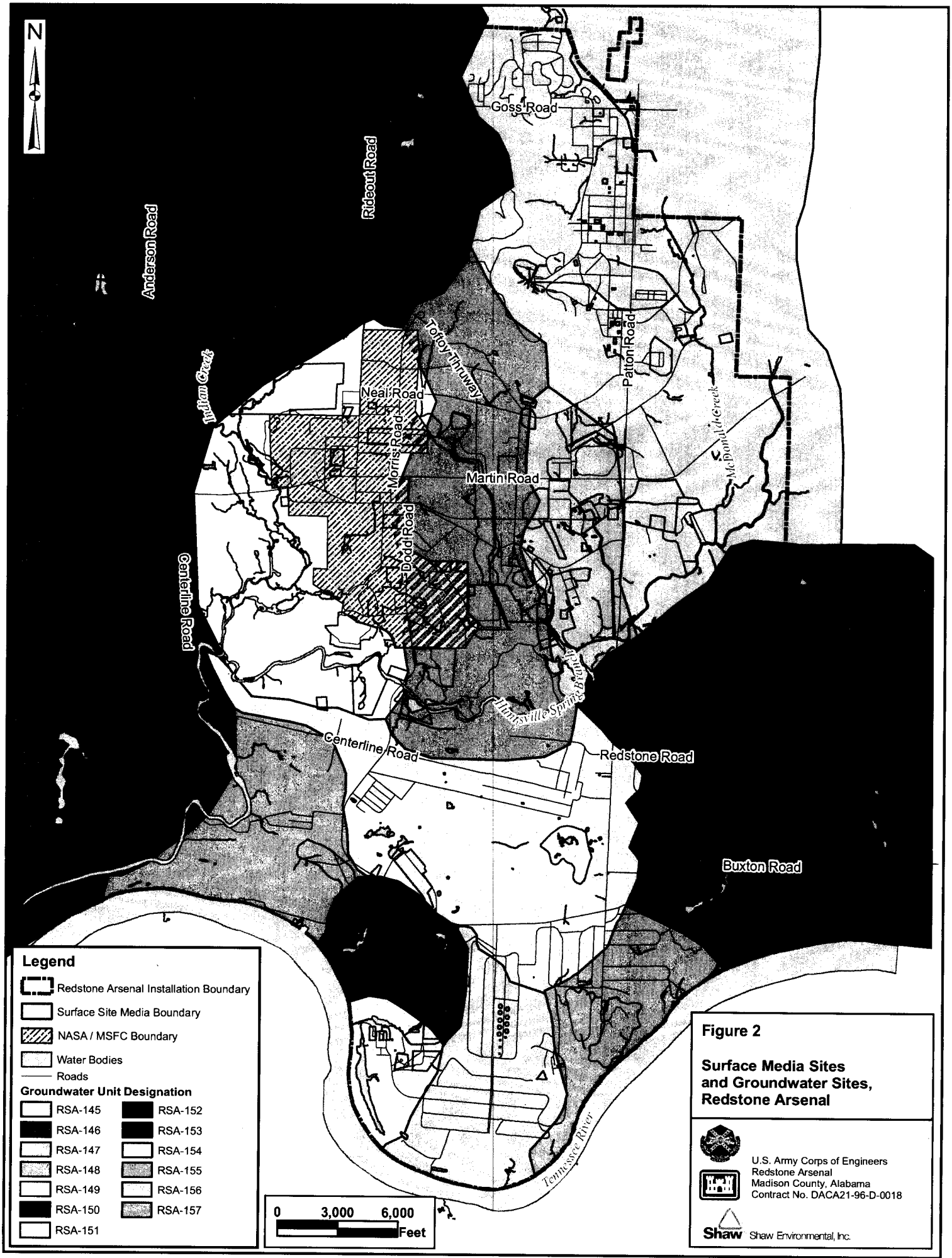

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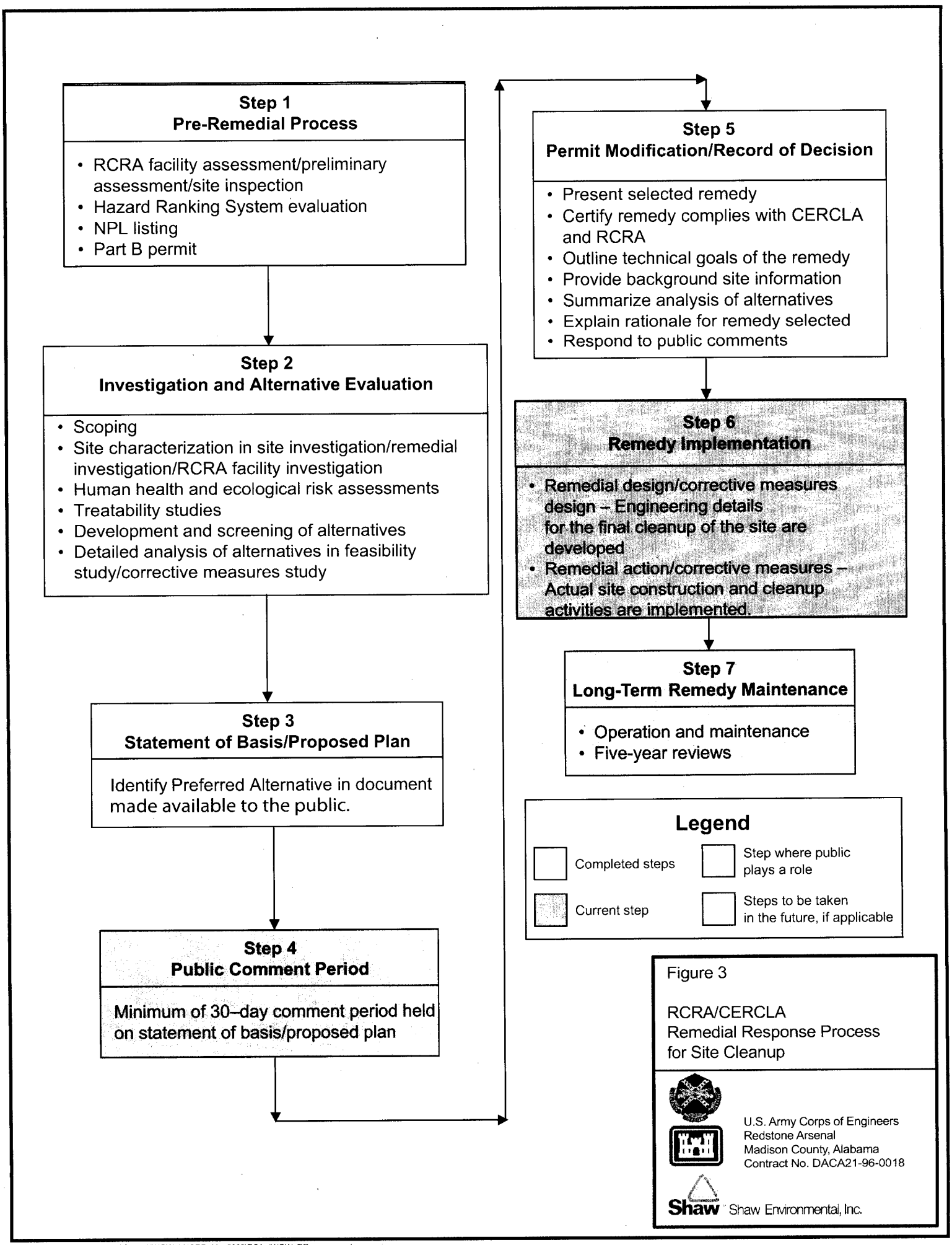

Figure 3

RCRA/CERCLA
Remedial Response Process
for Site Cleanup

U.S. Army Corps of Engineers
Redstone Arsenal
Madison County, Alabama
Contract No. DACA21-96-0018

Shaw Shaw Environmental, Inc.

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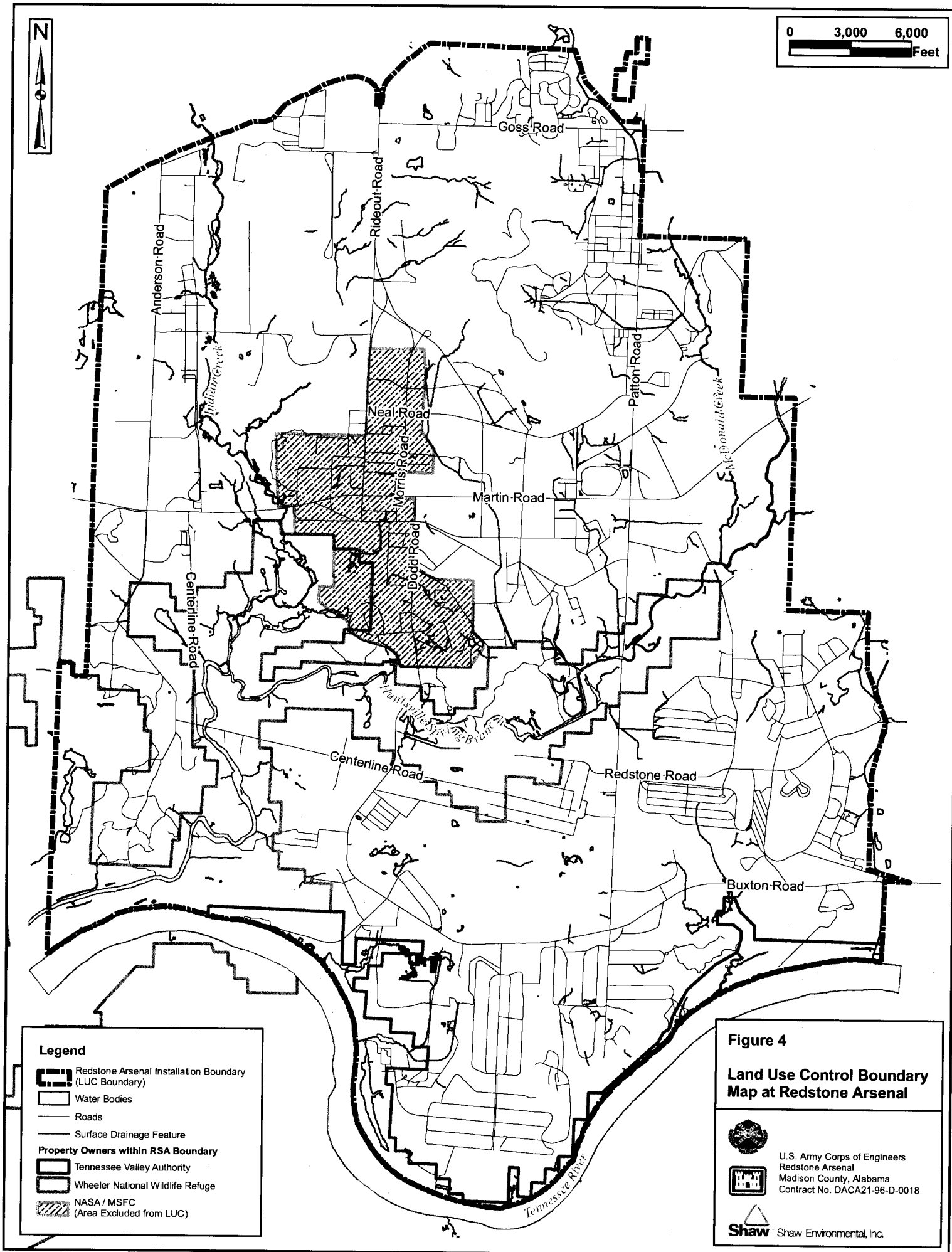

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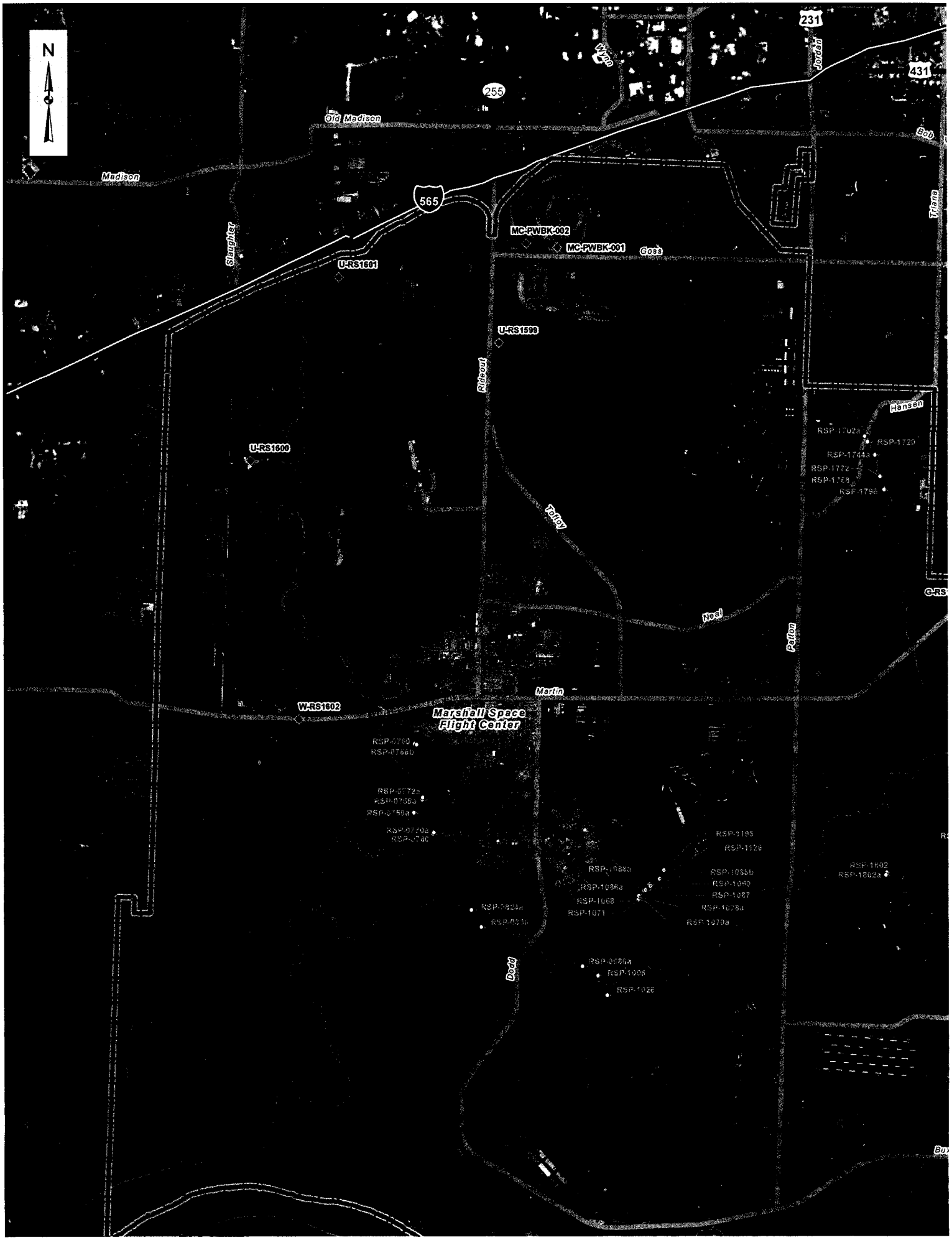
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431
255
565
Old Madison
Madison
Slaughter
Wynn
Jordan
Bob
Triana
MC-PWBK-002
MC-PWBK-001
Goss
U-RS1601
U-RS1599
U-RS1600
Ritcher
Talley
Hansen
Neal
Patton
Martin
W-RS1602
Marshall Space Flight Center
Dodd

APPENDIX A

REDSTONE ARSENAL ENVIRONMENTAL SITE ACCESS CONTROL PROGRAM

Redstone Arsenal
Regulation 200-7

Environmental Quality

Redstone Arsenal Installation Restoration Site Access Control Program

Headquarters
US Army Garrison – Redstone
Redstone Arsenal, AL 35898-5000

Date: 15 Feb 2008

UNCLASSIFIED

Redstone Arsenal Regulation 200-7

US Army Garrison – Redstone
Redstone Arsenal, Alabama 35898

Environmental Quality:
INSTALLATION RESTORATION SITE
ACCESS CONTROL PROGRAM

15 Feb 2008

OFFICIAL:

//s//
JOHN A. OLSHEFSKI
COL, OD
Garrison Commander

History. This printing is a revision of the original publication, October 2004, as a Redstone Arsenal Regulation. Preliminary site assessments have identified new sites that are included in this publication. Administration changes are also included.

Summary. This procedure establishes an access control program for environmental sites on Redstone Arsenal that are being addressed under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) or Superfund Law and Military Munitions Response Program (MMRP).

Applicability. This regulation applies to all organizational elements, including tenant activities, Installation Support Services Contracts, and Utility Providers on the installation.

Proponent and exception authority. The proponent of this regulation is the Directorate of Public Works, US Army Garrison – Redstone. The proponent has the authority to approve exceptions to this regulation that are consistent with law or regulation.

Army management control process. This regulation does not contain management control provisions in accordance with AR 11-2.

Suggested Improvements. Users are invited to send comments and suggested improvements on DA Form 2028 (Recommended Changes to Publications and Blank Forms) to US Army Garrison – Redstone, Public Works Environment, IMSE-RED-PWE, Redstone Arsenal, AL 35898.

Distribution. This publication is approved for public release; distribution is unlimited.

Summery of Revisions

Redstone Arsenal Regulation 200-7
RSA Installation Restoration Site Access Control Program

- First Issue May 2003.
- Revised Regulation and Appendices October 2004.
- Revised Appendices November 2005.
- Revised Regulation and Appendices May 2006.
- Revised Appendices November 2007.

TABLE OF CONTENTS

1. PURPOSE.

a. This regulation establishes policy, assigns responsibilities, and prescribes procedures for an Installation Restoration Site Access Control Program in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980 as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986 and codified in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) in 40 CFR 300, the Resource Conservation and Recovery Act (RCRA), the Occupational Safety and Health Act (OSHA) of 1970, and AR 200-1, Chapter 11, which establishes the Installation Restoration Program (IRP) for Army sites being addressed under CERCLA and MMRP.

b. This regulation provides a single source document available for use by all personnel who require access to a CERCLA and MMRP environmental site on Redstone Arsenal.

2. REFERENCES.

a. The National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 Code of Federal Regulations Parts 300.150 (Worker Health and Safety) and 311 (Worker Protection)

b. The Occupational Safety and Health Act (OSHA), 29 Code of Federal Regulations Part 1910.120 (Hazardous Waste Operations and Emergency Response)

c. AR 200-1, Environmental Protection and Enhancement, 21 February 1997

d. Executive Order 12580, 23 January 1987

e. Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)

f. Resource Conservation and Recovery Act (RCRA)

3. EXPLANATION OF ABBREVIATIONS AND TERMS. The explanation of abbreviations and terms used in this regulation is contained in the glossary.

4. POLICY.

Access to all environmental sites managed under the Redstone Arsenal Installation Restoration Program will be controlled in accordance with the federal regulations listed in paragraph 1.

5. RESPONSIBILITIES.

a. The Commander, US Army Garrison - Redstone (IMSE-RED-ZA), is responsible for:

(1) Establishing and conducting hazardous waste procedures IAW AR 200-1.

(2) Maintaining routine liaison with the various tenant commands and organizations on the installation for the purpose of controlling access to environmental sites to protect human health and the environment.

b. Director, Directorate of Public Works (IMSE-RED-PWE) is responsible for:

(1) Overall management of environmental sites (as defined in the glossary) and central coordination of the environmental site access control program at Redstone Arsenal.

(2) Establishing a system to ensure review of all planned land use activities utilizing Job Order Request (JORs), Individual Job Orders (IJOs) and Minor Service Orders (MSOs).

c. The Chief, Environmental Management Division, Public Works Environment (IMSE-RED-PWE) is responsible for:

(1) Maintaining the information systems necessary to update the site hazard ranking and required controls at the individual environmental sites as the Preliminary Site Assessments and Remedial Investigations proceed.

(2) Periodically updating the site hazard ranking and required controls.

(3) Overseeing the environmental site control program implementation associated with operations of assigned organizations.

(4) Supporting Garrison, tenant, installation support services, and utility provider organizations in compliance with matters relating to the environmental site access control program.

(5) Reviewing all JORs or land-use actions through the PWE project review process to ensure compliance with this regulation.

(6) Coordinating with IMSE-RED-PWE Master Planning to determine if current and future planned land use is consistent with this program.

d. The Chiefs of the primary organizational elements are responsible for:

(1) Complying with the provisions and procedures of this regulation.

(2) Appointing points of contact (POCs) to facilitate the control of activities on or adjacent to environmental sites within their area of control and other areas used by their organization for training. Through the POCs, the Chiefs are responsible for ensuring that all entry or activities on or adjacent to environmental sites is consistent with the required controls contained in the current hazard ranking and required controls matrix. This will include ensuring that:

(a) No entry onto an environmental site is made without prior review of the hazard rating and required controls matrix.

(b) All entries on an environmental site are made in accordance with the required controls matrix.

(c) No MSOs, JORs, or IJOs are started without prior review of the hazard rating and required controls matrix.

(d) Ensuring that all MSOs or IJOs conducted at environmental sites within their area of control and other areas used for their mission are implemented In Accordance With (IAW) this regulation. Any physical alterations to real property or land use must be coordinated through the Directorate of Public Works to ensure environmental project review procedures are met.

(e) Reporting any adverse human health or environmental incidents during the course of environmental site entry, including, discovery of any unexploded ordnance (UXO); personnel injuries or illness; unexpected tanks, vaults, or piping; or discovery of any signs of the presence of Chemical Warfare Material (CWM) immediately. Work shall be stopped at the point of discovery/incident.

e. The Installation Support Services Contractors and Utility Providers are responsible for:

(1) Reviewing MSOs and assigning the correct hazard rating and required controls matrix assigned that area IAW this regulation (See Appendix B) and Table 1 – Site Hazard Reviewing/Approval Authority for MSOs.

(2) Ensuring that all MSOs/IJOs conducted by them at environmental sites have been evaluated utilizing the Environmental Site Work Plan Evaluation Checklist (Appendix C) and that the Checklist has been completed, processed, and implemented IAW this regulation.

(3) Establishing a Standard Operating Procedure (SOP) for normal duty hour MSO reviews and after normal duty hour MSO reviews. The installation support services contractors and utility providers must ensure their internal environmental or safety personnel are included when evaluating MSOs for access to or performing intrusive work inside an environmental site boundary.

6. CERCLA/MMRP SITE ACCESS CONTROL INSTRUCTIONS.

a. CONCEPT.

(1) All entry onto environmental sites or activities adjacent to these sites which may impact the current or future contaminant nature, extent, or migration must be controlled and managed to ensure compliance with state and federal environmental regulations and this regulation.

(2) Each primary command and tenant has the responsibility to control their activities in compliance with this regulation.

(3) Activities on or immediately adjacent to environmental sites might result in:

- adverse human health or environmental impacts due to exposure to contaminants of potential concern,
- impact on the migration of contaminants, or
- future remediation of these contaminants.

(4) Because of this potential hazard or impact, an Environmental Site Work Plan Evaluation Checklist (Appendix C) must be completed before any activity commences on or adjacent to an environmental site. For MSOs, the formal review checklist may or may not be completed depending on the nature and extent of the MSO. An environmental or safety representative must make that decision (See Table 1 for review / approval authority).

b. PROCEDURES.

(1) A programmatic discussion of the Environmental Site Access Control Program at RSA is presented below. The specific procedures to be followed, along with the maps showing the site boundaries and the tables listing the known conditions at each of the sites and the associated necessary site access controls are presented in Appendix A, B, and C.

(2) The Installation Restoration Site Access Control Program at RSA includes the following key elements:

- JOR/IJO – Project review process
- MSO – Installation Support Services (ISS) Contractor/Utility Provider review
- Authorized Entrant Control – IMSE-RED-PWE Installation Restoration Branch staff / IMSE-RED-PWE Installation Restoration Branch contractors, primary organizational chiefs

- Unauthorized Entrant Control – Fences, signage, random site inspections

(3) Whenever practicable, entry into environmental site boundaries is prevented by fencing the entire area around the site. In those locations where fencing is not possible, signage has been placed at key entry points. As a final resort, administrative controls (including distribution of this document; training of personnel likely to enter multiple areas – utility workers, grounds keepers, and other methods) are used to warn entrants prior to entry.

(4) JOR Project Review Process. Review and approval of new construction projects, building alterations, or landscaping/land use alterations is reviewed and approved IAW a complex set of Army Regulations and documents. A JOR must be submitted through PWE before any construction projects or building/land use alterations begin. The JOR is routed through a number of organizations. All new projects, significant building activities, major renovations, or changes in future land use designation are focused through PWE. When a JOR is requested through PWE, it is reviewed following a standardized process. One aspect of this review is for environmental issues. The review considers all aspects of environmental impacts – natural/cultural resources, regulatory compliance, and hazardous waste concerns. Specifically the PWE/Environmental Management Division within the US Army Garrison – Redstone is responsible for conducting the environmental reviews. The IRP staff utilizes the procedure contained herein to determine if the project involves an environmental site and if so, the site controls that is required. The project may be: Approved, not being identified with an environmental site; Approved, contingent on the controls noted being implemented; or Disapproved. If the request is approved, contingent on the controls noted being implemented, it is the responsibility of the requestor to implement those controls prior to the start of work including development of a Site-Specific Safety and Health Plan (SSHP) if required.

This review is documented using a standardized process. This process evaluates:

- worker safety;
- contaminant migration and transport;
- impact on the regulatory investigation, removal, and remediation plans;
- debris/waste generated
- any special controls required due to the nature of the activity and the hazards present.

If the project must move forward based on mission requirements, then immediate site actions may be required. These actions may include but are not limited to implementing the defined controls with or without modification, implementation of a time critical or

non-time critical removal action, or reprioritization of the remedial action to meet project requirements. This could result in a request for funds from the project proponent to offset the difference between the funding needed for the action necessary to accommodate the project and the action that has been programmed under the IRP. All actions approved, contingent on the controls noted being implemented, must be properly coordinated through the PWE/Installation Restoration (IR) Branch with the Environmental Protection Agency (EPA) and the Alabama Department of Environmental Management (ADEM) before they begin. Given the critical nature or non-critical nature of the job the IR Branch may waive coordination with EPA and ADEM. The IR Branch will notify the requestor if concurrence is requested with the EPA and ADEM. The coordination with the regulatory agencies may result in significant time delays for the project.

(5) Minor Service Orders (MSO) Repair and Maintenance Review

(a) For those projects involving repair and maintenance of existing facilities or minor modifications below cost amounts specified in other documents, an MSO is used to initiate and document the work. For the purposes of executing this regulation MSOs can be divided into two groups. Planned, or work that can be accomplished during normal work hours, and unplanned (emergency), work that must be performed after duty hours. The PWE IR Branch must be informed of any environmental site activity either before MSO work is started or in accordance with Table 1 time requirements.

(b) Normal Duty Hours Repairs and Maintenance. Whenever repair or maintenance of existing buildings, utilities, or other facilities is initiated, the ISS Contractor, in coordination with utility providers if affected, shall develop and conduct a standard MSO review procedure. If the ISS/Utility Providers contractor representative determines that the repair or maintenance activity is going to occur within the boundaries of an identified environmental site or is adjacent to a site and may impact current or future site actions, then they must utilize the Site Hazard Level Reviewing/Approving Authority for MSOs listed below. This determination uses the same procedure (Appendices B, C, and D) used by IR Branch staff during the JOR project review process. The formal review checklist may or may not be completed depending on the nature and extent of the MSO.

(c) After Normal Duty Hours Repair and Maintenance. On occasion, unplanned repair (e.g. emergency repair of a ruptured water line, etc.) must be completed prior to the ISS/Utility Providers Contractor conducting a standard MSO review. In this situation, the ISS/Utility Provider contractor must develop a procedure for after hour's emergencies. Copies of this Regulation must be available to any personnel working after hours emergencies and they must be able to contact environmental/safety personnel to assist in determining if an environmental site is affected and if a site is affected determine what Site Hazard Level should be implemented. Utilizing the Environmental Site Boundaries Map (Appendix B) and the Environmental Site Access Matrix (Appendix C), if the Site Hazard Level is determined to be a 1 or a 5, then the ISS/Utility Provider Contractor must contact a PWE IR Branch representative before work is to proceed. If

the Site Hazard Level is determined to be a 2, 3, or 4, then the following personnel are authorized to complete the review:

Table 1. Site Hazard Level Reviewing/Approving Authority for MSOs

Site Hazard Level	Reviewing/Approving Authority	PWE IR Branch Oversight
1	PWE IR Branch evaluation required.	During Duty Hrs - 842-2836 Anytime - 651-0574
2	ISS/Utility Provider contractor environmental or safety personnel.	Telephonic notification to PWE IR Branch required prior to work start - 842-2836, 651-0574 or 714-4207
3 or 4	ISS/Utility Provider contractor environmental or safety personnel.	PWE IR Branch notification within 48 hours - 842-2836
5	PWE IR Branch evaluation required.	During duty hrs- 842-2836 Anytime - 651-0574 or 714-4207

The Rating Criteria Matrix (HTRW & OE – Hazards and Controls) is located in Appendix B, Table B-2.

c. AUTHORIZED ENTRANT CONTROL.

(1) For the purposes of this program, individuals entering environmental sites are divided into three groups:

- Hazardous, Toxic, or Radioactive Waste (HTRW) Site Workers (Installation Restoration Branch Team members) - This group includes all personnel performing site investigations, removal, or remedial activities. Their entry is controlled via a site-specific safety and health plan (SSHP) developed by the entering entity. The plan is in full compliance with the Occupational Safety and Health Agency (OSHA) regulations found in the Code of Federal Regulations (CFR) at 29 CFR 1910.120. The SSHP specifies all aspect of entry controls required including administrative procedures, engineering controls, personal protective equipment (PPE), and monitoring. Specific job activities mandate whether the forty - (40) hour or twenty-four (24) hour training in accordance with the requirements under 29 CFR 1910.120 is appropriate. The three-day on-site training is conducted by a supervisor who has received the eight (8) hour supervisory course. The site safety and health officer (SSHO) along with the site manager are responsible for site access control and enforcement.

- Non-HTRW Site Workers (authorized ISS/Utility Provider contractors and tenant personnel) - On occasion Non-HTRW workers may enter a designated Environmental Site area. This is especially true in the early phases of the Environmental Site process where the source of the contamination was a historical operational area subsequently converted to other operations. When this situation occurs, a determination is made regarding the specific controls required for these Non-HTRW personnel. In the early phases this determination

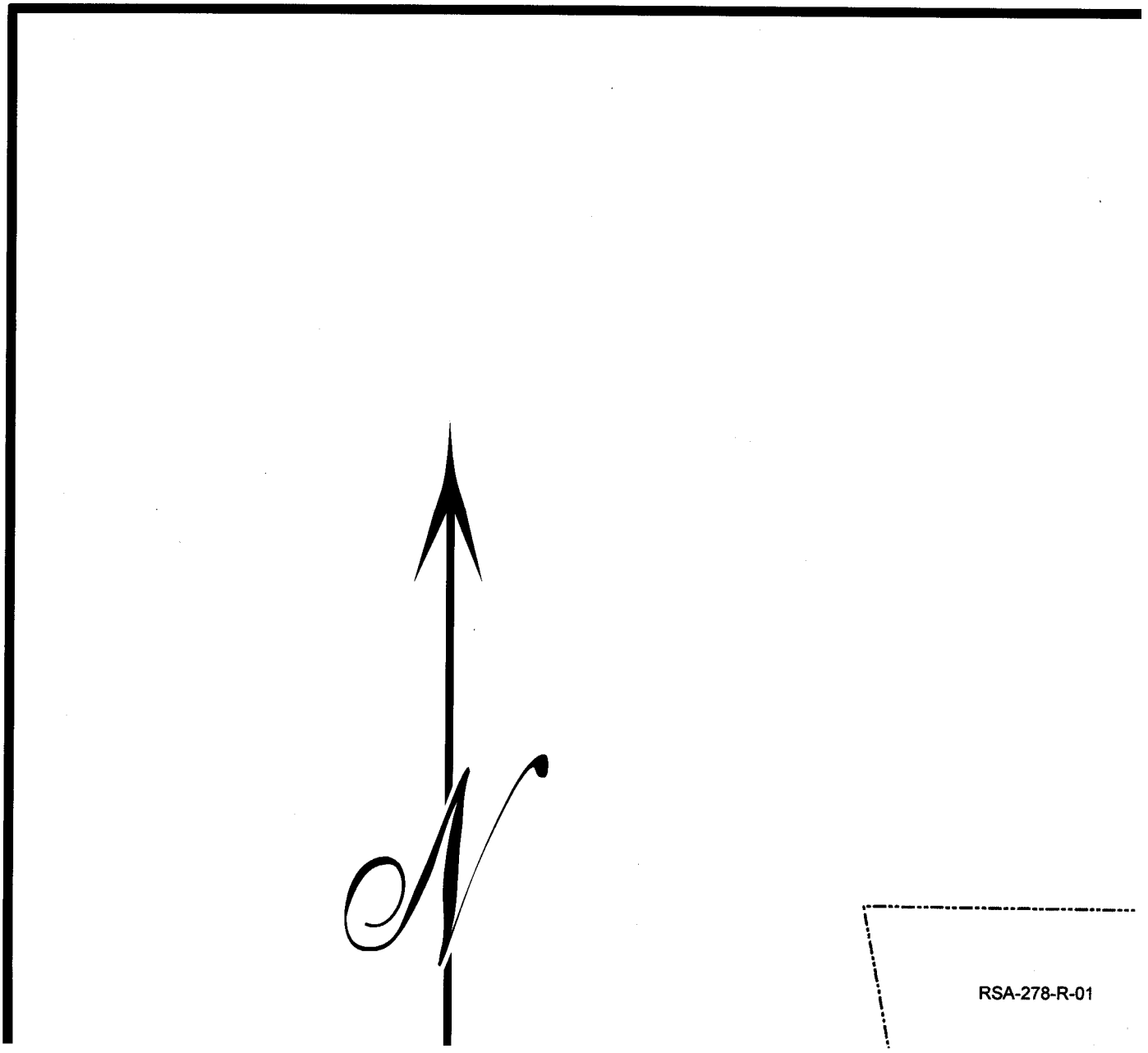
must be made with minimal data. As the investigation proceeds into the subsequent phases this determination can be made based on site specific sampling and monitoring. This determination and associated controls are documented on Table B-1 found in Appendix B of this program. This table is updated on a regular basis, as is, the IRP Site Boundaries Map (Appendix A). It is anticipated that this program and its associated documents will be available on the Internet (https://garrison.redstone.army.mil/dpw/emd/regs/regs.asp) to enable all RSA personnel to access this information. RSA IRP staff also disseminates this information via meetings with key managers of Non-HTRW workers known or suspected to enter the environmental site boundaries. Based on this information, these managers and supervisors can make informed decisions with regards to their workplace activities. IRP staff is available to provide site-specific reviews.

- Recreational Users - RSA has many recreational opportunities including: hunting, fishing, hiking, camping, bird watching, etc. These recreational users are authorized entry into Redstone Arsenal via manned security gates at the facility boundaries. If the individual is entering Redstone Arsenal for recreational purposes (or is a RSA worker doing non-work related activities) then he/she is directed to the Outdoor Recreation office. This office has available a map identifying all approved hunting and other recreational areas as well as prohibited areas. The identification of an environmental site is one of the bases for identifying the area as a prohibited area. Game wardens and other security personnel routinely enforce the recreational use regulations. In most areas used for recreational purposes, fencing and signage is practicable as an access control method. Fencing clearly identifies the areas as environmental areas and prohibits entry without prior approval.

e. UNAUTHORIZED ENTRANT CONTROL. Unauthorized entry is possible at any location if the intruder is sufficiently motivated. As a general protection against unauthorized entry, the entire facility (Redstone Arsenal) has a perimeter fence and manned entry points. Only authorized personnel may enter the facility. This provides the opportunity to limit entry to personnel with no awareness of facility activities. Visitors enter only to meet RSA personnel and they must identify where they are going and whom they are meeting to gain entry. Environmental sites are not the only reason entry into areas is restricted. There is a very high degree of awareness about not entering areas without specific permission for various reasons. These reasons include: national security, safety – active weapons testing ranges, as well as other operational reasons. The program outlined above when combined with the facility wide security program substantially reduces the probability of unauthorized entry. As part of our ongoing environmental site investigations we routinely include the trespasser on our risk assessments as a current and future receptor.

APPENDIX A

ENVIRONMENTAL SITE BOUNDARY MAP



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APPENDIX B

TABLE B-1: ENVIRONMENTAL SITE ACCESS MATRIX

TABLE B-2: RATING CRITERIA MATRIX (HTRW & OE – HAZARDS AND CONTROLS)

RSA REGULATION 200-7 APPENDIX B-1 SITE ACCESS CONTROL

* See Table B-2 for Hazard Rating Definitions

* See Table 1 in RSA Regulation 200-7 for Reviewing/Approving Authority

		Non-Intrusive Activity (Suface)		Intrusive Activity (Sub-Suface or Significant Surface Disturbance)				
		Hazard Rating		Hazard Rating		Munitions and Explosives of Concern (MEC) Rating Basis	HTRW Contaminants of Potential Concern (COPC)	HTRW Media of Concern
SITE #	SITE DESCRIPTION	HTRW	MEC/CWM	HTRW	MEC/CWM			
MSFC-002	INACTIVE ABANDONED DRUM DISPOSAL SITE	3	4	3	4	No known MEC hazard	PAHs, Pesticides	Surface Soil, Subsurface Soil, Sediments
MSFC-003	INACTIVE 'OLD BONE YARD' DISPOSAL SITE	3	1	2	1	Potential CWM; Confirmed UXO	Metals, Pesticides, CWM	Surface Soil, Subsurface Soil
MSFC-027	INACTIVE (M-1) WASTE ACCUMULATION AREA	3	5	3	5	Inactive Waste Accumulation Area	Pesticides, PCBs, Metals	Surface Soil
MSFC-034	FORMER CHEMICAL PRODUCTION SUMP, BLDG 4481	2	1	2	1	Confirmed CWM	SVOCs, CWM, PCBs, Metals	Surface Soil, Subsurface Soil, Groundwater
MSFC-035	INACTIVE SUMP/TILED DRAIN FIELD EAST OF TA	3	3	5	4	No known MEC hazard	PRO, Metals, VOCs	Soil, Groundwater
MSFC-053	FORMER PROPELLANT STORAGE AREA	3	4	2	4	No known MEC hazard	Metals, VOCs, SVOCs	Surface Soil
MSFC-077	INACTIVE OPEN BURNING/ DISPOSAL PITS	3	3	3	3	HRR show period of operations after demil dates.	Metals	Surface soil, Subsurface Soil
RSA-013	UNLINED INACTIVE OPEN BURN PADS	2	1	2	2	Confirmed ordnance scrap; potential UXO	Metals, VOCs, Perchlorates, Explosives	Surface Soils, Subsurface Soils, Surface Water, and Sediment
RSA-014	UNLINED INACTIVE BURN TRENCHES	1	1	1	1	Potential CWM; Confirmed ordnance scrap and UXO	Metals, VOCs, Perchlorates, Explosives	Surface Soil, Subsurface Soil
RSA-032	INACTIVE SCRAP METAL STORAGE YARD	3	3	3	3	Where did UXO/CWM potential come from?	VOCs	Surface Soil, Subsurface Soil
RSA-045	SMOKE MUNITIONS PLANT 3	2	4	2	4	No known MEC hazard	Metals, POL, Pesticides, PCBs	Surface Soil, Subsurface Soil
RSA-048	INACTIVE CLOSED SANITARY LANDFILL	2	4	2	4	No known MEC hazard	SVOCs, Metals	Surface Soil, Subsurface Soil, and Sediment
RSA-049	CAPPED ARSENIC WASTE LAGOONS-WEST	1	4	1	4	Potential CWM; No ordnance expected	Metals, SVOCs	Surface Soil, Subsurface Soil, Sediment, and Surface Water
RSA-051	INACTIVE MUNITIONS DEMIL & DISPOSAL AREA	2	3	2	2	Potential CWM; Potential UXO	Metals, White Phosphorus	Surface and Subsurface Soil
RSA-052	INACTIVE MUNITIONS DEMIL & DISPOSAL AREA	2	1	2	1	Confirmed CWM; Confirmed ordnance scrap and UXO	Metals, VOCs, SVOCs, CWM	Surface Soil, Subsurface Soil
RSA-053	INACTIVE SANITARY & INDUSTRIAL LANDFILL	2	4	1	4	No known MEC hazard	VOCs, SVOCs, Metals, Pesticides	Surface Soil, Subsurface Soil, and Sediment
RSA-054	INACTIVE SANITARY & INDUSTRIAL LANDFILL	2	4	1	4	No known MEC hazard	VOCs, Pesticides	Surface Soil, Subsurface Soil
RSA-056	CAPPED ARSENIC WASTE PONDS-SOUTH	3	4	1	4	Potential CWM; No ordnance expected	Metals	Surface Soil, Subsurface Soil, and Sediment
RSA-057	INACTIVE ARSENIC WASTE LAGOON-EAST	1	4	1	4	Potential CWM; No ordnance expected	Metals	Surface Soil, Subsurface Soil
RSA-058	INACTIVE RUBBLE FILL & WASTE PILE	1	4	1	4	No known MEC hazard	Pesticides, Metals, VOCs, SVOCs, Explosives	Surface Soil, Subsurface Soil, Groundwater, Sediment, and Surface Water
RSA-059	INACTIVE CLOSED CONSTRUCTION RUBBLE FILL	3	4	1	4	No known MEC hazard	VOCs, PAHs, Metals	Surface Soil, Subsurface Soil, Sediment, and Surface Water
RSA-060	INACTIVE SANITARY & INDUSTRIAL LANDFILL	1	4	1	4	No known MEC hazard	Metals, VOCs, SVOCs, Pesticides	Surface Soil, Subsurface Soil, and Sediment

		Non-Intrusive Activity (Suface)		Intrusive Activity (Sub-Suface or Significant Surface Disturbance)		* See Table B-2 for Hazard Rating Definitions * See Table 1 in RSA Regulation 200-7 for Reviewing/Approving Authority		
		Hazard Rating		Hazard Rating		Munitions and Explosives of Concern (MEC) Rating Basis	HTRW Contaminants of Potential Concern (COPC)	HTRW Media of Concern
SITE #	SITE DESCRIPTION	HTRW	MEC/CWM	HTRW	MEC/CWM			
RSA-061	INACTIVE MUNITIONS DEMIL & DISPOSAL AREA	2	1	1	1	Potential CWM; Confirmed ordnance scrap and UXO	Metals, CWM, SVOCs, Explosives	Surface Soil, Subsurface Soil
RSA-063	INACTIVE CHEMICAL MUNITIONS STORAGE AREA	2	1	2	1	Confirmed CWM; Potential UXO	Metals, CWM	Surface Soil, Subsurface Soil
RSA-064	INACTIVE MUNITION DEMIL & DISPOSAL AREA	3	2	3	2	Potential CWM; Potential UXO	Metals, CWM	Surface Soil, Subsurface Soil
RSA-065	FORMER CHEMICAL DRUM STORAGE AREA	3	3	3	3	Potential CWM; Potential UXO	Metals	Surface Soil, Sediment, and Surface Water
RSA-066	INACTIVE ASH DISPOSAL SITE & DEMIL AREA	3	1	2	1	Potential CWM; Confirmed ordnance scrap and UXO	Metals	Surface Soil, Subsurface Soil, and Sediment
RSA-067	FORMER CHEMICAL DRUM STORAGE SITE	3	3	3	3	Potential CWM; Potential UXO	Metals, SVOCs	Surface Soil, Sediment, and Surface Water
RSA-068	INACTIVE TOXIC CHEMICAL DISPOSAL AREA	3	1	2	1	Confirmed CWM; Confirmed UXO	VOCs, Metals, Explosives, Pesticides, CWM	Surface Soil, Subsurface Soil, Sediment, and Surface Water
RSA-069	FORMER CHEMICAL DRUM STORAGE AREA	5	3	5	3	Potential CWM; Potential UXO	VOCs, CWM breakdown products	Surface Soil, Sediment, and Surface Water
RSA-083	INACTIVE PAINT SPRAY BOOTH SUMP	3	4	3	4	No known MEC hazard	Metals, VOCs	Surface Soil, Subsurface Soil
RSA-087	INACTIVE PROPELLANT WASTES STORAGE PAD-BLDG-7368	2	4	2	4	No known MEC hazard	Perchlorate	Subsurface Soil
RSA-088	INACTIVE PROPELLANT WASTES STORAGE PAD-BLDG-7625	3	4	3	4	No known MEC hazard	VOCs, Perchlorate	Subsurface Soil
RSA-094	CHLORINATED SOLVENT DISTILLATION UNITS-BLDG 7625	3	4	3	4	No known MEC hazard	VOCs	Subsurface Soil
RSA-095	CHLORINATED SOLVENT DISTILLATION UNITS-BLDG 7368	3	4	1	4	No known MEC hazard	VOCs	Subsurface Soil
RSA-096	CHLORINATED SOLVENT DISTILLATION UNITS-BLDG 7740	2	4	2	4	No known MEC hazard	VOCs	Subsurface Soil, Groundwater
RSA-097	CHLORINATED SOLVENT DISTILLATION UNITS-BLDG 7726	3	4	3	4	No known MEC hazard	VOCs, perchlorate	Subsurface Soil
RSA-109	FORMER CHEMICAL MUNITIONS STAGING AREA	3	3	3	3	Potential CWM; Potential UXO	Metals, SVOCs, Explosives	Surface Soil, Subsurface Soil
RSA-110	FORMER CHEMICAL DRUM STORAGE/CONSTRUCTION DEBRIS	3	1	3	2	Confirmed CWM; Confirmed ordnance scrap and UXO	Metals, SVOCs, CWM	Surface Soil, Subsurface Soil
RSA-112	FORMER DEMILITARIZATION & DISPOSAL SITE	3	1	3	1	Potential CWM; Confirmed ordnance scrap and UXO	Metals, Explosives	Surface Soil, Subsurface Soil
RSA-113	INACTIVE DISPOSAL TRENCHES & BURN PITS	3	1	3	1	Potential CWM; Confirmed ordnance scrap and UXO	Metals, Explosives, CWM	Surface Soil, Subsurface Soil
RSA-114	INACTIVE MADKIN MOUNTAIN ROCK QUARRY	2	1	2	1	Suspected CWM; Confirmed ordnance scrap and UXO	Metals, UXO (CWM)	Surface Soil, Surface Water
RSA-117	HVA CHLORINE PLANT #2	2	4	2	4	No known MEC hazard	Metals, PCBs	Surface Soil, Subsurface Soil
RSA-122	FORMER LEWISITE MFG PLANTS SITE	1	4	1	4	Potential CWM; No ordnance expected	Mercury, Arsenic, SVOCs, CWM	Surface Soil, Subsurface Soil, Sediment
RSA-126	INACTIVE OPEN BURN TRENCH	3	3	3	3	Potential CWM; Potential UXO	Metals	Surface Soil, Subsurface Soil

* See Table B-2 for Hazard Rating Definitions
* See Table 1 in RSA Regulation 200-7 for Reviewing/Approving Authority

SITE #	SITE DESCRIPTION	Non-Intrusive Activity (Suface) Hazard Rating HTRW	Non-Intrusive Activity (Suface) Hazard Rating MEC/CWM	Intrusive Activity (Sub-Suface or Significant Surface Disturbance) Hazard Rating HTRW	Intrusive Activity (Sub-Suface or Significant Surface Disturbance) Hazard Rating MEC/CWM	Munitions and Explosives of Concern (MEC) Rating Basis	HTRW Contaminants of Potential Concern (COPC)	HTRW Media of Concern
RSA-134	INACTIVE DISPOSAL TRENCH/OPEN BURNING PIT	3	3	3	2	Potential UXO	Metals	Surface Soil, Subsurface Soil, and Sediment
RSA-135H	INACTIVE SUMP FOR 1.1 PROPELLANT WASTES	3	4	3	4	No known MEC hazard	Metals, Explosives	Surface Soil, Subsurface Soil
RSA-138M	ROP Tetryl Processing Line	3	4	3	4	No known MEC hazard	Metals, Explosives, Perchlorate, SVOCs, VOCs	Surface Soil, Subsurface Soil
RSA-139	CAPPED ARSENIC WASTE POND - NORTH	1	4	1	4	Potential CWM; No ordnance expected	Metals, SVOCs	Surface Soil, Subsurface Soil, Sediment
RSA-140	INACTIVE DISPOSAL AREA NEAR T/S TOWER	3	4	2	4	No known MEC hazard	Metals	Surface & Subsurface Soil
RSA-141	CLOSED 4.2 INCH MORTAR SITE, BLDG 4656	3	1	3	1	Potential CWM; Confirmed UXO	Metals, VOCs	Surface Soil, Subsurface Soil
RSA-142	CHLORINATED SOLVENT SPILL	2	4	2	4	No known MEC hazard	Metals, VOCs, Perchlorate	Surface Soil, Subsurface Soil
RSA-143	UNDERGROUND STORAGE TANK SITE	2	4	2	4	No known MEC hazard	BTEX, MTBE, Lead	Surface Soil, Subsurface Soil, and Groundwater
RSA-144	CHLORINATED-SOLVENT DISTILLATION UNIT 6	3	4	3	4	No known MEC hazard	VOCs, Metals	Surface Soil, Subsurface Soil, and Sediment
RSA-145	GROUNDWATER UNIT 01	4	4	4	4		TCE	Groundwater
RSA-146	GROUNDWATER UNIT 02	4	4	4	4		Metals, VOCs, SVOCs, Explosives, Perchlorate	Groundwater
RSA-147	GROUNDWATER UNIT 03	4	4	4	4		Metals, VOCs, SVOCs, Explosives	Groundwater
RSA-148	GROUNDWATER UNIT 04	4	4	4	4		Metals, VOCs, SVOCs, Explosives	Groundwater
RSA-149	GROUNDWATER UNIT 05	4	4	4	4		Metals, VOCs, SVOCs, Explosives	Groundwater
RSA-150	GROUNDWATER UNIT 06							
RSA-151	GROUNDWATER UNIT 07	4	4	4	4		Metals, VOCs, SVOCs, Explosives	Groundwater
RSA-152	GROUNDWATER UNIT 08	4	4	4	4		Metals, VOCs, SVOCs, Explosives	Groundwater
RSA-153	GROUNDWATER UNIT 09							
RSA-154	GROUNDWATER UNIT 10							
RSA-155	GROUNDWATER UNIT 11						VOCs	Groundwater
RSA-156	GROUNDWATER UNIT 12	4	4	4	4		VOCs, Perchlorate	Groundwater
RSA-157	GROUNDWATER UNIT 13	4	4	4	4			
RSA-183	FORMER LEWISITE PRODUCTION FACILITY	1	4	1	4	Potential CWM; No ordnance expected	Metals, SVOCs, VOCs, CWM	Surface Soil, Subsurface Soil, Sediment, and Surface Water

* See Table B-2 for Hazard Rating Definitions
* See Table 1 in RSA Regulation 200-7 for Reviewing/Approving Authority

		Non-Intrusive Activity (Suface)		Intrusive Activity (Sub-Suface or Significant Surface Disturbance)				
		Hazard Rating		Hazard Rating		Munitions and Explosives of Concern (MEC) Rating Basis	HTRW Contaminants of Potential Concern (COPC)	HTRW Media of Concern
SITE #	SITE DESCRIPTION	HTRW	MEC/CWM	HTRW	MEC/CWM			
RSA-187	NORTHERN THIOKOL MIXING FACILITY	2	4	2	3	Site is adjacent to RSA-188 burning/burial areas	VOCs, Explosives, Perchlorate, Metals	Surface Soil, Subsurface Soil, and Groundwater
RSA-188	NORTHERN BURIAL AREA / BURNING GROUND #3	3	3	3	1	Confirmed UXO and ordnance scrap	VOCs, Metals, Perchlorate	Surface Soil, Subsurface Soil, and Groundwater
RSA-189	MOTOR/OXIDIZER PREP FACILITIES	3	4	3	4	No known MEC hazard	VOCs, Metals	Surface Soil, Subsurface Soil, Groundwater
RSA-190	DISPOSAL/DRAINAGE AREA WEST OF ROP LINE 2	3	4	3	4	No known MEC hazard	VOC, Explosives, Metals, Perchlorate	Surface Soil, Subsurface Soil, and Groundwater
RSA-191	ROP LINE 1 SERVICE FACILITIES	2	4	2	4	No known MEC hazard	VOCs, SVOCs, PRO, Metals, Perchlorate	Surface Soil, Subsurface Soil, and Groundwater
RSA-192	TETRYL AND IGNITER PROCESSING (ROP LINE 1)	3	4	3	4	No known MEC hazard	VOCs, Explosives, Metals, Perchlorate	Surface Soil, Subsurface Soil, and Groundwater
RSA-193	THIOKOL IGNITER PREPARATION FACILITY	3	4	3	4	No known MEC hazard	PRO, PAHs, Explosives, Perchlorate, Metals	Surface Soil, Subsurface Soil, and Groundwater
RSA-194	PHYSICAL TEST LABORATORY AND STORAGE FACILITIES	2	4	2	4	No known MEC hazard	VOCs, Perchlorate, SVOCs, Metals, Explosives	Surface Soil, Subsurface Soil, and Groundwater
RSA-195	THIOKOL PROPELLANT MIX FACILITY #1	3	4	3	4	No known MEC hazard	VOCs, Perchlorate	Surface Soil, Subsurface Soil, and Groundwater
RSA-196	TEST STAND AND CLEANING BUILDING	3	4	2	4	No known MEC hazard	VOCs, Metals, Perchlorate	Surface Soil, Subsurface Soil, and Groundwater
RSA-197	ROCKET MOTOR TEST STAND	3	4	3	4	No known MEC hazard	VOCs, Explosives, Perchlorate, Metals	Surface Soil, Subsurface Soil, and Groundwater
RSA-198	THIOKOL EQUIPMENT/TOOL CLEANING FACILITY	3	4	3	4	No known MEC hazard	VOCs, Perchlorate, Explosives	Surface Soil, Subsurface Soil, and Groundwater
RSA-199	THIOKOL PROPELLANT MIX FACILITY #2	3	4	3	4	No known MEC hazard	VOCs, Metals, Perchlorate	Surface Soil, Subsurface Soil, and Groundwater
RSA-200	ROP LINE 5 AREA OPERATIONS FACILITIES	3	4	2	4	No known MEC hazard	VOCs, SVOCs, POL, Explosives, Metals, PCBs, Perchlorates	Surface Soil, Subsurface Soil, and Groundwater
RSA-201	THIOKOL RESEARCH LABORATORY	3	4	2	4	No known MEC hazard	VOCs, Perchlorate, SVOCs, Metals	Surface Soil, Subsurface Soil, and Groundwater
RSA-202	GRADED AREA NORTHWEST OF ROP STORAGE IGLOOS	3	4	3	4	No known MEC hazard	VOCs, Perchlorate, Metals, Explosives	Surface Soil, Subsurface Soil, and Groundwater
RSA-203	IGLOO AREA LOADING DOCK	2	4	2	4	No known MEC hazard	VOCs, Perchlorate, Metals, Explosives	Surface Soil, Subsurface Soil, and Groundwater
RSA-204	THIOKOL OXIDIZER FACILITY	3	4	3	4	No known MEC hazard	VOCs, Perchlorate, Metals, POL, Explosives	Surface Soil, Subsurface Soil, and Groundwater
RSA-205	PHOTO LAB AND MOTOR SERVICE FACILITY	3	4	3	4	No known MEC hazard	PRO, Metals	Surface Soil, Subsurface Soil, and Groundwater
RSA-206	PROPELLANT MIXING FACILITY #2 AND CASTING FACILITY	3	4	3	4	No known MEC hazard	VOCs, Perchlorate, Explosives, Metals	Surface Soil, Subsurface Soil, and Groundwater
RSA-207	ROHM & HAAS GORGAS LABORATORY	3	4	3	4	No known MEC hazard	VOCs, SVOCs, Perchlorate, PRO, Metals	Surface Soil, Subsurface Soil, and Groundwater
RSA-208	SOUTH PLANT TESTING FACILITIES	3	4	3	4	No known MEC hazard	VOCs, Perchlorate, PRO, Metals	Surface Soil, Subsurface Soil, Surface Water, and Groundwater
RSA-209	PROPELLANT CRUSHING/GRINDING AND FUSE PRODUCTION	3	4	3	4	No known MEC hazard	VOCs, SVOC, Perchlorate, Explosives, Metals	Surface Soil, Subsurface Soil, and Groundwater

* See Table B-2 for Hazard Rating Definitions
* See Table 1 in RSA Regulation 200-7 for Reviewing/Approving Authority

SITE #	SITE DESCRIPTION	Non-Intrusive Activity (Suface) Hazard Rating HTRW	Non-Intrusive Activity (Suface) Hazard Rating MEC/CWM	Intrusive Activity (Sub-Suface or Significant Surface Disturbance) Hazard Rating HTRW	Intrusive Activity (Sub-Suface or Significant Surface Disturbance) Hazard Rating MEC/CWM	Munitions and Explosives of Concern (MEC) Rating Basis	HTRW Contaminants of Potential Concern (COPC)	HTRW Media of Concern
RSA-210	NITROGLYCERINE WASH HOUSE	3	4	3	4	No known MEC hazard	VOCs, Perchlorate, Metals	Surface Soil, Subsurface Soil, and Groundwater
RSA-211	SOUTH PLANT STORAGE MAGAZINES	3	4	3	4	No known MEC hazard	Perchlorate, Metals	Surface Soil, Subsurface Soil, and Groundwater
RSA-212	PROPELLANT DRY HOUSES	3	4	3	4	No known MEC hazard	Perchlorate, Explosives, Metals	Surface Soil, Subsurface Soil, and Groundwater
RSA-213	ROP LINE 4 AREA OPERATIONS FACILITIES	3	4	2	4	No known MEC hazard	VOCs, SVOCs, Perchlorate, Metals	Surface Soil, Subsurface Soil, and Groundwater
RSA-214	ROP LINE 6 AREA OPERATIONS FACILITIES	3	4	3	4	No known MEC hazard	VOCs, SVOCs, Metals, Explosives	Surface Soil, Subsurface Soil, and Groundwater
RSA-215	RSA-146 HISTORIC SERVICE FACILITIES	3	4	3	4	No known MEC hazard	VOCs, SVOCs, PRO, Metals, PCBs, Pesticides	Surface Soil, Subsurface Soil, and Groundwater
RSA-217	INERT STORAGE WAREHOUSE FACILITIES	3	4	3	4	No known MEC hazard	VOCs, SVOCs, PRO, Metals	Surface Soil, Subsurface Soil, and Groundwater
RSA-218	DRMO OPEN STORAGE AREA	3	4	3	4	No known MEC hazard	Metals	Surface and Subsurface Soils
RSA-219	CHEMICAL STORAGE AREA IN SALVAGE YARD	3	4	3	4	No known MEC hazard	VOCs, Metals	Surface Soil, Subsurface Soil, and Groundwater
RSA-220	CONSTRUCTION MATERIAL STORAGE YARD	3	4	2	4	No known MEC hazard	Metals	Surface Soil, Subsurface Soil, and Groundwater
RSA-221	FUSE STORAGE AND MUNITIONS DISPOSAL AREA	5	5	5	5		VOCs, Metals, Explosives	Surface Soil, Subsurface Soil, and Groundwater
RSA-224	CONTAINER STORAGE AREA	3	4	3	4	Potential staging area for CWM rounds	POL, SVOCs (PAHs), VOCs, Metals	Surface Soil, Subsurface Soil, and Groundwater
RSA-225	FUSE MODIFICATION LINE 7	3	4	3	4	Nitrocellulose in soil	VOCs, SVOCs. Metals, Nitrocellulose	Surface Soil, Subsurface Soil, and Groundwater
RSA-226	OPEN STORAGE 54-2	3	4	3	4	No known MEC hazard	Pesticides, PCBs	Surface Soil, Subsurface Soil, and Groundwater
RSA-227	INACTIVE WASHRACK	3	4	3	4	No known MEC hazard	VOCs, SVOCs, POL, Metals	Surface Soil, Subsurface Soil, Groundwater, Surface Water, and Sediment
RSA-228	SEWAGE TREATMENT PLANT 2	3	4	2	4	No known MEC hazard	Metals	Surface Soil, Subsurface Soil, and Groundwater
RSA-229	FORMER PX SERVICE STATION	3	6	3	6	No known MEC hazard	VOCs, PRO, Metals	Surface Soil, Subsurface Soil, and Groundwater
RSA-230	ABANDONED RUBBLE PILE	3	3	3	3	Potential MEC	Pesticides, Metals, Nitrocellulose	Surface Soil, Subsurface Soil, and Groundwater
RSA-231	SMF #1 MIXING & PREP FACILITIES	3	4	2	4	Smoke Munitions Filling and Prep. Facility	VOCs, SVOCs, POL, Nitrocellulose, Metals	Surface Soil, Subsurface Soil, and Groundwater
RSA-233	SMF#2 MIXING AND PREPARATION FACILITIES	3	4	3	4	Smoke Munitions Filling and Prep. Facility	Nitrocellulose, Metals	Surface Soil, Subsurface Soil, and Groundwater
RSA-234	WASTE DISPOSAL PIT	3	4	3	4	No known MEC hazard	VOCs, Nitrocellulose, POL, Metals	Surface Soil, Subsurface Soil, and Groundwater
RSA-236	GRENADE PACKING AND ASSEMBLY	3	4	3	4	No known MEC hazard	PRO, SVOCs, Metals	Surface Soil and Subsurface Soil
RSA-237	PROPELLANT CUTTING AND DRYING	3	4	3	4	No known MEC hazard	VOCs	Subsurface Soil and Groundwater

		Non-Intrusive Activity (Suface)		Intrusive Activity (Sub-Suface or Significant Surface Disturbance)		* See Table B-2 for Hazard Rating Definitions * See Table 1 in RSA Regulation 200-7 for Reviewing/Approving Authority		
		Hazard Rating		Hazard Rating		Munitions and Explosives of Concern (MEC) Rating Basis	HTRW Contaminants of Potential Concern (COPC)	HTRW Media of Concern
SITE #	SITE DESCRIPTION	HTRW	MEC/CWM	HTRW	MEC/CWM			
RSA-238	HVA PLANT #2 MUSTARD LINES 5 & 6	5	3	5	1	Potential CWM; No ordnance expected	Mercury, Beryllium, Pesticides	
RSA-239	LINE # 1 BOILER HOUSE	3	4	2	4	No known MEC hazard	PAH	Soils, Groundwater
RSA-249	INACTIVE OLD BONE YARD DISPOSAL SITE	3	4	3	3	Potential CWM; No ordnance expected	VOC, SVOC, pesticides	Surface and Subsurface soil, Groundwater
RSA-250	FORMER STORAGE WAREHOUSE - BUILDING 778	2	4	2	4	No known MEC hazard	SVOCs, Metals	Soil
RSA-252	INCENDIARY BOMB FACILITY PLANT 2 AREA	5	4	5	3	Incendiary bomb, Mustard filling plant	Pesticides, PAH	Soils, Groundwater
RSA-253	UTILITY/FLAMMABLE MATERIALS STORAGE (B6109)	3	4	3	4	No known MEC hazard	Metals, PRO	Surface and subsurface soils
RSA-255	MANGANESE ORE STORAGE AREA N. OF RSA-65	2	3	2	3	Site overlaps RSA-67	Metals	Surface, subsurface soils and groundwater
RSA-258	FORMER PAINT SPRAY BUILDING 7862	2	4	2	4	No known MEC hazard	Metals, PRO	Surface Soil
RSA-261	LANCE MISSILE CONDITIONING FACILITY	3	4	3	4	No known MEC hazard	PRO	Ground Water
RSA-262	CWS WAREHOUSE AREA (BLDGS. 8021 THRU 8027)	3	4	2	4	Explosives detected in groundwater	VOCs, PRO, Explosives, Metals	Groundwater, Surface and subsurface soils
RSA-263	CWS MOTOR POOL (B 8017)/CHANGE HOUSE (B 8020)	3	4	3	4	No known MEC hazard		
RSA-265	GASOLINE DRUM STORAGE AREA	3	4	3	4	No known MEC hazard		
RSA-269	FORMER UST, BUILDING 7852	5	4	5	4	No known MEC hazard	Gasoline Range Organics (GRO), Benzene and other VOCs	Soil and Groundwater
RSA-271	FORMER BOILER HOUSE, BUILDING 7729	3	4	3	4	No known MEC hazard	SVOC, POL, PAH	Subsurface soil and Groundwater
RSA-272	FORMER UST FOR BOILER UNIT, BUILDING 7650	5	4	5	4	No known MEC hazard	POL	Surface and Subsurface soil
RSA-273	PROPELLANT CONDITIONING AND MOTOR CYCLING	3	4	3	4	No known MEC hazard	Perchlorate, Metals, SVOCs	Surface and subsurface soils
RSA-274	PHYSICS LABORATORY &HIGH EXPLOSIVES MAGAZINE, 7540	3	4	3	4	No known MEC hazard	Metals, SVOCs	Surface and Subsurface soil
RSA-275	FORMER FILM PROCESSING LABORATORY, BUILDING 7173	3	4	2	4	No known MEC hazard	Metals, SVOCs	Surface and Subsurface soils
RSA-276	FORMER BOILER HOUSE , BUILDING 7362	5	4	5	4	No known MEC hazard	Metals, POL	Surface and Subsurface soil
RSA-278	HIGHWAY 565 AREA	4	5	4	5			
RSA-279	SMOKE GRENADE AREA	4	5	4	5			
RSA-280	SKUNK HOLLOW SMALL ARMS RANGE	4	5	4	5			
RSA-281	DISPOSAL TRENCHES AT RSA-046 RANGE	2	2	2	1	Potential CWM; Potential UXO	Metals, Explosives	Surface & Subsurface Soil

* See Table B-2 for Hazard Rating Definitions
* See Table 1 in RSA Regulation 200-7 for Reviewing/Approving Authority

		Non-Intrusive Activity (Suface)		Intrusive Activity (Sub-Suface or Significant Surface Disturbance)				
		Hazard Rating		Hazard Rating				
SITE #	SITE DESCRIPTION	HTRW	MEC/CWM	HTRW	MEC/CWM	Munitions and Explosives of Concern (MEC) Rating Basis	HTRW Contaminants of Potential Concern (COPC)	HTRW Media of Concern
RSA-282	Former Mortar Test Site(NOT in Range)	4	5	4	5			
RSA-285	Former WP Grenade Test Area	4	5	4	5			
RSA-A	INACTIVE PROPELLANT STORAGE WELLS	3	4	3	4	No known MEC hazard	Metals, VOCs	Surface Soil, Subsurface Soil, Sediment, and Surface Water
RSA-C	ABANDONED ARMY PROPELLANT MIXER BLDG	3	4	4	4	No known MEC hazard	Metals, SVOCs	Surface Soil, Subsurface Soil
RSA-D	FORMER CYANIDE-BASE PAINTING OPERATION	2	4	3	4	No known MEC hazard	SVOCs, Metals	Surface Soil, Subsurface Soil

HAZARD RATINGS APPENDIX B-2

Table B-2. Rating Criteria Matrix (HTRW + MEC - Hazards + Controls).

The highest detections at each site were used in comparisons to EPA Region IX PRGs

HTRW Access Control and Land Use Control Matrix

1	High	Exeedances of EPA Region IX action levels, typically 100 times PRGs for carcinogens, or 3 times PRGs for non-carcinogens	Worker (40 hr)	a) Work Plan Required; b) SSHP	Level C or per SSHP	Specific Review by Installation Restoration staff required
2	Medium	Exceedances of 10 times the EPA Region IX PRGs for industrial workers and greater than range of background values	Operator (8 - 24 hr) consistent with activity	a) Work Plan Required; b) SSHP	Level D modified upon activity specific review - else Level C	Specific Review by Installation Restoration staff required
3	Low	Exceedances of EPA Region IX PRGs for Industrial Worker above background levels	Awareness (5 min - 8 hr)	a) Work Plan Required; b) SSHP	Level D	Specific Review by Installation Restoration staff required
4	Risk Allows unrestricted activity	No exceedances of EPA Region IX PRGs for Industrial Worker above Background values	None	None	None	None
5	Unknown	PA only or other very limited data	Worker (40 hr)	a) Work Plan Required; b) SSHP	Level C or per SSHP	Specific Review by DEM - IRP staff required

Munitions and Explosives of Concern (MEC) Access Control and Land Use Control Matrix

1	Frequent	On-site MEC assessments have identified UXO / CWM and high probability for additional MEC, examples include UXO burial trenches.	Worker (40 hr).	UXO Support required - anomaly avoidance - marking of site specific work area and UXO support on scene at all times work is in progress is required.	Level C or per SSHP.	Specific Review by Installation Restoration staff required.
2	Likely	Historical record and onsite MECE assessments indicate potential for presence of UXO / CWM. Range impact and diposal areas fit into this category.	Operator (8 - 24 hr).	UXO Support required - anomaly avoidance - marking of area for specific work required. UXO will determine need for continued presence on a case by case basis.	Level D modified upon activity specific review - else Level C.	Specific Review by Installation Restoration staff required.
3	Occasional	Historical record indicates potential UXO hazard. This criteria is met if occasional OE scrap items have been detected, or if there is potential for kickout items from nearby disposal/detonation areas.	Awareness (5 min - 8 hr).	UXO Support required - anomaly avoidance - UXO on-site each day prior to start of work. UXO will determine need for continued presence on a case by case basis.	Level D.	Specific Review by Installation Restoration staff required.
4	Seldom	Historical Record Seach found no MEC (CWM or UXO) use history - or - RI complete and site cleared for unrestricted access with no land use restrictions. Site declared safe based on approved UXO clearance survey.	None.	None.	None.	None.
5	Unknown	PA only or other very limited data.	Worker (40 hr).	UXO Support required - anomaly avoidance - marking of site specific work area and UXO support on scene at all times work is in progress is required.	Level C or per SSHP.	Specific Review by Installation Restoration staff required.

APPENDIX C

Environmental Site Work Plan Evaluation Checklist
(Non-RI/FS/ROD)

IRP/MMRP Work Plan Evaluation Checklist

Installation Restoration Program (IRP), RSA Reg. 200-7, Appendix C, (Non-RI/FS/ROD)

Site / Activity Information	
Environmental Site Number:	Project Name or PWE Tracking #:
Name of Requestor: Phone #:	Contact for Additional Information: Name: Office Symbol: Phone: Bldg. # or Area:

A Project Work Plan is required to be submitted through PWE for an environmental evaluation. The Installation Restoration Program may require other submittals before any job commences.

Required Submittals if an **IRP/MMRP** Site is Affected:

☐ - Key Personnel List - Project Manager, Safety Officer, etc. ☐ - Project Safety and Health Plan

☐ - Project Work Plan ☐ - Other, Specify:

☐ COPIES OF REQUIRED SUBMITTALS SHALL BE FORWARDED TO IMSE-RED-PWE IR BRANCH BEFORE JOB COMMENCES

Reviewer Certification / Recommendation

1. Based on my review of the data provided about the nature of the work to be performed this activity is:
   - ☐ - Approved, Project is not on an identified IRP/MMRP site.
   - ☐ - Approved, contingent on implementation of required controls noted below.
   - ☐ - Disapproved, contact the Installation Restoration Branch, 842-2836, for possible solutions & resubmit revised plan.

2. Regulatory oversight concurrence ☐ - is / ☐ - is not - recommended by ☐ - ADEM, ☐ - EPA.

Primary Reviewer Signature Garrison/PWE/Installation Restoration Program, 842-2836	Date
Secondary Reviewer Signature Garrison/PWE/Installation Restoration Program	Date

Regulatory Agency Review

ADEM Signature: Date:	☐ - Concur ☐ - Do Not Concur ☐ - Conditional Concurrence (See below)	EPA Signature: Date:	☐ - Concur ☐ - Do Not Concur ☐ - Conditional Concurrence (See below)

Additional Control Requirements	ADEM	EPA

Special Instructions / Restrictions / Notes

1. Worker Exposure Evaluation

Core Question / Evaluation Goal: Are IRP/MMRP site contaminants present at levels in site media which pose a threat to worker health unless controls are implemented?

If yes, see Concerns and Required Controls noted below.

Concern	Required Controls
a. Surface Soil Contaminants: ☐ - Yes, controls required ☐ - No, NA / no specific controls required	☐ - Dust Control methods ☐ - Personal Protective Equipment (consistent with job / task hazard analysis) ☐ - IRP approved Site Specific Safety & Health Plan (SSHP)
b. Subsurface Soil Contaminants: ☐ - Yes, controls required ☐ - No, NA / no specific controls required	☐ - No excavation below depth ☐ - Control water entry into all excavations ☐ - Other, specify:
c. Groundwater contaminants: ☐ - Yes, controls required ☐ - No, NA / no specific controls required	☐ - No excavation which exposes groundwater ☐ - No pumping / discharge of groundwater to surface without sampling and IRP approval for release ☐ - Other, specify:
d. Other Media, specify (sediment, SW, etc.) ☐ - Yes, controls required ☐ - No, NA / no specific controls required	☐ - Exposure control for following media: ☐ - ☐ -

2. IRP/MMRP Contaminant Migration /Transport Evaluation

Core Question / Evaluation Goal: Does the activity involve work that might impact the rate or nature of IRP/MMRP contaminant migration or will the work potentially transport site contaminants to other locations?

If yes, see Concerns and Required Controls noted below.

Concern	Required Controls
a. Increased surface contaminant migration / transport ☐ - Yes, controls required ☐ - No, NA / no specific controls required	☐ - Runoff control techniques ☐ - Drainage control techniques ☐ - Other, specify:
b. Increased subsurface contaminant migration / transport ☐ - Yes, controls required ☐ - No, NA / no specific controls required	☐ - No subsurface excavation ☐ - No disturbance of surface cover which would increase subsurface water infiltration / permeation, i.e. grade to drain ☐ - Other, specify:
c. Increased migration / transport of other media contaminants – specify: ☐ - Yes, controls required ☐ - No, NA / no specific controls required	☐ - No changes in site drainage characteristics that would increase groundwater, sediment or other media contaminant migration / transportation ☐ - No ☐ - Other, specify:

3. IRP/MMRP Investigation / Removal / Remediation Evaluation
Core Question / Evaluation Goal: Does the activity involve work that might impact the ability to conduct further site investigation, removal actions, remedial efforts?
If yes, see Concerns and Required Controls noted below.

Concern	Required Controls
a. Impaired ability to perform future investigative work (well placement, specimen collection, etc.) ☐ - Yes, controls required ☐ - No, NA / no specific controls required	☐ - Relocation of proposed structures to maintain access or proposed future sampling locations ☐ - ☐ - Other, specify:
b. Potential for activity to result in additional contaminant releases which might complicate interpretation / future removal or remedial action ☐ - Yes, controls required ☐ - No, NA / no specific controls required	☐ - No future activity involving the following chemicals: ☐ - No buildings or utilities over areas identified on attached map ☐ - Other, specify:
c. Impaired ability to conduct TCRA or NTCRA activities ☐ - Yes, controls required ☐ - No, NA / no specific controls required	☐ - No building over areas identified on attached map ☐ - Adjust project schedule to allow completion of TCRA / NTCRA completion ☐ - Other, specify:
d. Impaired ability to conduct Remedial Actions ☐ - Yes, controls required ☐ - No, NA / no specific controls required	☐ - No building over areas identified on attached map ☐ - No changes in site drainage characteristics ☐ - Other, specify:

4. Activity Debris / Waste Evaluation
Core Question / Evaluation Goal: Does the activity involve work that might generate solid waste that might be hazardous waste due to the material being contaminated by IRP/MMRP release related contaminants?
If yes, see Concerns and Required Controls noted below.

Concern	Required Controls
a. Building demolition / debris might contain IRP/MMRP contaminants that could be transported off-site by the planned work ☐ - Yes, controls required ☐ - No, NA / no specific controls required	☐ - Do not remove specific types of debris noted below: ☐ - Collect specific media samples for analysis for the following contaminants: ☐ - Other, specify:

b. IRP/MMRP contaminants might result in building demolition debris being classified as a RCRA waste or might trip other special disposal requirements. ☐ - Yes, controls required ☐ - No, NA / no specific controls required	☐ - Disposal of the following debris in a RCRA permitted hazardous waste landfill: ☐ - Collect specific media samples for analysis for the following contaminants: ☐ - Other, specify:
c. Planned work might directly transport contaminated site media to other locations ☐ - Yes, controls required ☐ - No, NA / no specific controls required	☐ - No removal of the following media: ☐ - Decontamination of all tools, equipment, vehicles prior to leaving the site. ☐ - Other, specify:
d. Planned work might generate waste media that might result in the media being classified as a RCRA waste or might trip other special disposal requirements. ☐ - Yes, controls required ☐ - No, NA / no specific controls required	☐ - Analyze all transported site media for the following contaminants: ☐ - Dispose of the following media as indicated: ☐ - Other, specify:

5. Special Hazards Evaluation

Core Question / Evaluation Goal: Does the site have safety and health issues requiring special actions (e.g., UXO, CWM / CWA, etc.)?

If yes, see Concerns and Required Controls noted below.

Concern	Required Controls
a. OE / UXO – Potential for Ordnance / Explosives or Unexploded Ordnance. ☐ - Yes, controls required ☐ - No, NA / no specific controls required	☐ - UXO construction support required ☐ - UXO removal / clearance required prior to any work ☐ - Other, specify:
b. CWM / CWA – Potential for chemical warfare material / chemical warfare agent. ☐ - Yes, controls required ☐ - No, NA / no specific controls required	☐ - CWM / CWA removal / clearance required prior to any work ☐ - CWM / CWA real time monitoring required for all site activities ☐ - Other, specify:
c. Other special hazards, specify: ☐ - Yes, controls required ☐ - No, NA / no specific controls required	☐ - ☐ - ☐ -

APPENDIX D

INSTALLATION RESTORATION PROGRAM MAINTENANCE AND INSPECTION OF CONTROLS

Access controls require periodic inspection and maintenance. Written programs such as this document and associated tables require regular review and updating. Physical controls, such as fences, signage, caps (coverage over contaminant areas), and drainage controls require not only inspection but also periodic maintenance such as fence repair, signage replacement, cap mowing, and drainage silt removal. The purpose of this section is to capture the inspection and maintenance plan for each common control type listed in Table D-1.

TABLE D-1 Administrative Controls

Control Type	Inspection / Review	Maintenance / Repair
Site Control Program Document	Review and amend as required every 3 years	As required based on periodic review or change in associated processes
Site Control Appendix A & B	Review and amend during the annual program review – and/or – as required based on new site characterization or site boundary investigation findings	Amend table and map based on inspection / review findings; notify all affected parties and post revised table / map on facility GIS network system
Physical Controls		
Control Type	Inspection / Review	Maintenance / Repair
Fencing	Inspect all fencing listed on Table B-1 annually	Repair per inspection to maintain access control
Signage	Inspect all signage listed on Table B-1 annually – Note: signage is inspected with fencing however, some areas have signage only but no fencing	Repair / replace if signage is missing or becomes illegible
Land Cover (Caps)	Inspect all land cover (caps) listed on Table B-1 annually	Mow as needed to prevent growth of trees that could disrupt cap, repair any erosion features that may impact permeability.
Drainage Controls	Inspect all drainage controls listed on Table B-1 annually	Remove silt / debris / other impairments to drainage (Beaver dams, etc.) that impacts drainage as needed

ACRONYMS AND ABBREVIATIONS

ADEM - Alabama Department of Environmental Management
AR - Army Regulation
ATV - all terrain vehicles
CERCLA - Comprehensive Environmental Response, Compensation and Liability Act
CFR - Code of Federal Regulations
CHF - contaminant hazard factor
CPOC - contaminants of potential concern
CWM - chemical warfare material
DA - Department of the Army
DD - decision document
DDE - dichlorodiphenyldichloroeth
DDD - dichlorodiphenyldichloroethane
DDT - dichlorodiphenyltrichloroethaneylene
DESB - Defense Explosive Safety Board
DoD - Department of Defense
e.g. – that is
EPA - Environmental Protection Agency
Etc. – Et Cetera, and so forth
FS - feasibility study
GAF - General Aniline and Film
GIS - geographic information systems
HH - Human Health
HTRW - hazardous, toxic, or radioactive waste
IAW - in accordance with
IJO - Individual Job Order
IMSE – Installation Management Southeast Region
IR - Installation Restoration (Branch)
IRP - Installation Restoration Program
ISS - Installation Support Services
JOR - Job Order Request
LF - landfill
LUC - Land Use Control
MEC – Munitions and Explosives of Concern
MMRP – Military Munitions Response Program
MSFC - Marshall Space Flight Center
MSO - Minor Service Order
NASA - National Aeronautics and Space Administration
NCP - National Oil and Hazardous Substances Pollution Contingency Plan
NFA - no further action
OE - ordnance/explosive
OSHA - Occupational Safety and Health Act
OU - Operable Unit
PA - Preliminary Assessment

ACRONYMS AND ABBREVIATIONS
(Continued)

PAH - polyaromatic hydrocarbons
PCB - polychlorinated biphenyls
PCE - perchloroethylene
POC - point of contact
PPE - personal protective equipment
PRG - preliminary remediation goal
PWE – Public Works Environment
RARE - Redstone Arsenal Rocket Engine Facility
RCRA - Resource Conservation and Recovery Act
RED - Redstone
RI - remedial investigation
ROD - Record of Decision
RRSE - relative risk site evaluation
RSA – Redstone Arsenal
SAR - supplied air respirator
SARA - Superfund Amendments and Reauthorization Act
SCBA - self-contained breathing apparatus
SF - Safety Office
SOP - standard operating procedure
SSHO - Site Safety and Health Officer
SSHP - site-specific safety and health plan
SVOC - semi-volatile organic compounds
TCE - Trichloroethylene
TCRA - time critical removal action
TPH - total petroleum hydrocarbons
US – United States
UST - underground storage tank
UXO - unexploded ordnance
VOC - volatile organic compounds
WNWR - Wheeler National Wildlife Refuge

GLOSSARY

1. CONTAMINATION TYPE. Environmental sites have the potential to have either HTRW (hazardous, toxic, radioactive waste) contamination and/or OE/MEC (Ordnance/Explosive) present at depth or on the surface.

a. HTRW contamination. Our understanding of the nature and extent of HTRW contamination on a site evolves over time. The area contaminated, depth of contamination, and number and concentration of contaminants is evaluated during the RI (Remedial Investigation) process. The health risks associated with these contaminants depend on this information and the activity/work being performed. The specific site controls required to achieve an acceptable risk level are listed in Table B-1, located in Appendix B of this Regulation.

b. OE/UXO/MEC contamination. As with HTRW contaminants our understanding of the OE issues at a site also evolves. Initially our understanding is based solely on site history. The accuracy of this history has a significant level of uncertainty. During the RI process, the principle of "anomaly avoidance" is practiced. This practice does NOT clear the site of any unexploded ordnance (UXO) or other OE/MEC or CWM (Chemical Warfare Material). It simply identifies suspect areas using some type of detection system. As such, the primary anomaly avoidance process clears no site identified as "OE/MEC contaminated". Therefore, any site identified as OE/MEC contaminated requires some level of support for any and all entry. Again, specific site controls for access to OE/MEC contaminated sites are listed in Table B-1 in Appendix B.

2. HAZARD RATING. The level of HTRW or OE/MEC hazard known at any given time will be classified as Low, Medium, or High. This rating is based on the current RI data. It will change as the RI effort progresses. This rating is intended only as a general guide to the level of risk. It is not designed to evaluate the human health risk of any specific activity, since the level of understanding of the HTRW and OE/MEC concern is not fully understood until the RI process is complete.

a. Low. The Low designation signifies that HTRW contamination may exceed background levels but presents a risk within the CERCLA acceptable range. In the case of OE/MEC, it indicates that historical records or site anomaly avoidance activities indicate the potential for OE at the site. It does not indicate that the area is free from OE/MEC and that it is safe to enter the area without specific OE/MEC support.

b. Medium. This indicates HTRW levels above minimal risk levels, but below RSA action levels. The level of OE/MEC hazard lies above the Low criteria but does not warrant the High designation.

c. High. The High designation indicates that the level of HTRW contamination is greater than background and also exceeds human health based action levels established by the program manager. OE/UXO/MEC has been clearly identified as present on site,

either by historical records or OE/UXO/MEC anomaly avoidance activities in support of HTRW investigations.

3. ACTIVITY. The health risk posed by any contaminant depends on the activity/work being done. For ease of management all activity is divided into one of two categories, either intrusive or non-intrusive.

a. Intrusive. Intrusive activities are defined as any activity or work which disturbs the surface soil at a depth greater than one foot. Examples of intrusive activities include but are not limited to:

(1) Excavation including utility repair, installation or relocation as well as digging of any type deeper than one foot such as installing utility poles, building footings.

(2) Drilling using any system – shovel, auger, backhoe, etc.

(3) Other penetrations: Explosive process, etc.

(4) Forestry involving tree removal, ground breaking at depths greater than one foot, etc.

(5) Grounds maintenance involving intrusion such as deep planting and mowing of areas without complete grass cover, or mowing where the nature of the grass cover is minimal or mowing settings are such that heavy dust is produced.

b. Non-Intrusive. Non-intrusive activities are those that do not involve disturbing soil at a depth greater than one foot. Examples of non-intrusive activities include but are not limited to:

(1) Walking on/through the site for any reason. This includes authorized entry such as recreational (hunting, fishing, bird watching, etc) or work activities as well as unauthorized entry (trespass).

(2) Driving on/through the site. As with walking, this includes authorized or unauthorized entry by any means – car, truck, ATV, 4-wheeler, motorcycle or other conveyance.

(3) Performing any work activity on the site involving surface soil contact only – e.g. mowing of fully grass covered areas, general trimming and other above ground activity, equipment maintenance, forestry involving observation or other non-intrusive activity only, etc.

(4) Performing any recreational activity on the site involving surface soil contact only.

4. LAND USE. Land use is intended to use standard CERCLA and MMRP land use receptor scenarios that may be applicable to current or future land use. Land uses may include the following:

a. Residential. The residential classification is intended to indicate that the land is, may, or will be used for single or multi-family dwellings.

b. Industrial. This classification in intended to indicate that the land is, may, or will be used for industrial operations to include offices, shops, warehouses, and other types of activities of this nature.

c. Recreational – Low Exposure – This classification is designed to indicate that the land is, may, or will be used for recreational activities not resulting in recurrent, significant surface soil exposures. Examples may include general hunting, fishing, walking, running, etc.

d. Recreational – High Exposure – This classification is designed to indicate that the land is, may, or will be used for recreational activities resulting in recurrent, significant surface soil exposures. Examples may include children's contact playgrounds, sports fields (baseball, football, soccer, etc), or other recreational activities involving intimate contact with surface soil.

e. Military. This use may include a variety of activities including field training, ranges, operational areas, etc.

f. Other. This class is to be used for those activities not captured in one of the other five classes. Assignment to this class should be made in coordination with the IRP risk manager. Specific examples of land uses in this class include:

g. Well installation. Installation of a groundwater well for human consumption, industrial processes, or agricultural purposes. Well installations are prohibited.

h. Surface water use. Installation of equipment for surface water diversion/use for human consumption, industrial processes, or agricultural purposes.

5. SITE ACCESS CONTROLS. Access controls are those measures that must be implemented to protect the health and welfare of individuals involved in the type of activity to be undertaken. Potential site access controls include but are not limited to signage, fencing, project reviews, regulation and inspections.

6. TRAINING. This administrative control is intended to familiarize the person entering the site with the nature and extent of HTRW or OE/MEC hazard. It is designed to be consistent with the level of site knowledge and the risk associated with the type of activity. Training levels include:

a. Awareness. This training level is designed to briefly orient the person with general RSA environmental site hazards. It is reserved for those sites rated "Low". The training time can range from a few minutes up to one hour or more depending on the specific activity and the site.

b. Operator. This training level is designed to provide an increased level of training to those persons whose activity is such that their risk may be greater due to the nature and extent of HTRW or OE/MEC contamination. It is generally used for those sites rated "Medium". This level of training may require from two (2) to eight (8) hours to complete depending on the specific activity and site. In certain cases it may involve up to 24 hours of training.

c. Worker. This level of training is designed to provide a level of training consistent with any site rated "High". The combination of activity and contamination is such that specific protective measures must be taken prior to the conduct of work. This level is designed to meet the full requirements under the OSHA standard for site workers (40 hour training per 29 CFR 1910.120).

7. ENGINEERING AND ADMINISTRATIVE CONTROLS. These controls are designed to reduce exposure by way of active engineering practices to reduce the need or prevent control by the use of PPE (personal protective equipment). Typical engineering controls include:

a. SOPs. Using approved SOPs that reduce exposure via ingestion, inhalation or skin absorption.

b. Dust control methods. This control may include surface soil wetting to reduce dust generation, use of specific equipment or techniques known to reduce dust levels, etc. If dust control is indicated, then measurement of dust levels should be evaluated to document/demonstrate effectiveness.

c. Equipment use. Using equipment such as backhoes, excavators, etc. to reduce contact with soil by using equipment to move soil rather than hand digging or other manual techniques is an effective control for reducing exposures.

d. Fencing and other barriers or signage. Installation of fencing or other barriers to prevent unauthorized entry into identified sites is a primary access control method. In certain cases fencing is impractical in which case signs will be used to mark controlled access areas. The environmental site map attached to this procedure is also an access control system.

e. Other. A wide variety of other techniques may be applicable to a given project. Whenever possible the use of engineering and administrative controls is preferred and recommended rather than the use of PPE. This procedure is itself an administrative access control technique.

8. PERSONAL PROTECTIVE EQUIPMENT (PPE). The last choice for protection should be PPE. It is appropriate when engineering, administrative, and training controls are ineffective or until they can be implemented. Clothing and other personal protective equipment (respirator, hard hat, gloves, impervious ensembles, etc.) provide additional protection from exposure. The standard EPA (Environmental Protection Agency) PPE classification system is used:

a. Level D. Standard work clothing. Shirt, pants, shoes, work gloves (as appropriate), etc.

b. Level C. This level may include some type of protective clothing (impervious suit, chemical resistant gloves, etc) but adds some respiratory protection such as a dust mask, air purifying respirator, etc.

c. Level B. This level includes chemically impervious clothing but a higher level of respiratory protection such as a self-contained breathing apparatus (SCBA).

d. Level A. This is the highest level of PPE and includes a totally encapsulated suit and SCBA or supplied air respirator (SAR) along with an escape pack.

9. LAND USE CONTROLS. Land use controls are designed to prevent certain land uses without specific evaluation. Examples of land use controls include: deeds, covenants, and other legal documents restricting the land to certain types of use or prohibiting certain types of activities. The CERCLA/MMRP ROD (record of decision) is a legal document that is binding on the CERCLA/MMRP landholder and prevents certain types of land use.

Legal Controls - The Land Use Controls (LUCs) noted in this program are INTERIM LUCs only. They are designed to control site access and to capture key controls that will likely be formalized in the final ROD for the CERCLA OU/MMRP. As such they are subject to change as investigation data is obtained. The final ROD will contain the legally enforceable land use controls selected for each site/operable unit.

10. ACTIVITY RESTRICTIONS. This control is primarily designed for use in cases of groundwater or surface water contamination by restricting well installation, surface water use or contact, etc.

11. PERMITS. In some cases the site may require specific controls too numerous to delineate in this procedure. To control these more complicated land use issues, permits may be required to obtain specific approval for work from internal groups (PWE, etc), regulators (EPA, ADEM, etc), or others within the DA or DoD. For example, excavation in an area identified as OE/MEC contaminated may require specific UXO clearance based on a safety submission from the Defense Explosive Safety Board (DESB).

APPENDIX B

MEMORANDUM OF AGREEMENT
REDSTONE ARSENAL AND CITY OF HUNTSVILLE

MEMORANDUM OF AGREEMENT
BETWEEN
US ARMY GARRISON-REDSTONE ARSENAL
AND
THE CITY OF HUNTSVILLE, ALABAMA

SUBJECT: Use of Groundwater

1. PURPOSE: This Memorandum of Agreement (MOA) between the United States Army (Army) and the City of Huntsville (Huntsville) is entered into to oversee the well permitting process and its role in controlling exposure to contaminated groundwater in the vicinity of the Redstone Arsenal (RSA).

The Army enters into this MOA pursuant to the authority of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. § 9601 et seq., and the Defense Environmental Restoration Program, 10 U.S.C. § 2700 et seq. The City of Huntsville enters into this MOA pursuant to City of Huntsville Code Chapter 12, Article VII, Division 2, Section 12-432.

The purpose of this MOA is to provide a framework for cooperation and coordination between the Parties in order to prevent or minimize potential exposure of off-post residents or workers to contaminated groundwater, and to prevent further migration of the RSA plume off of the Arsenal. The Army and the U.S. Environmental Protection Agency (EPA) selected this action as part of the interim remedy in the September 2007 Interim Record of Decision under CERCLA to address contaminated groundwater on an installation-wide basis. The Army, as the lead agency for this Interim Remedial Action, intends to utilize the City of Huntsville well permitting process for implementing the objective to protect human health and the environment.

2. BACKGROUND: As described in the Interim Remedial Action for Installation-Wide Groundwater Interim Record of Decision (September 2007), RSA is bordered by four local government entities. The city of Huntsville and Madison County surround RSA to the north, east, and west. The city of Madison is adjacent to a very small portion of the northwest corner of the Arsenal. Morgan County lies south of the Arsenal across the Tennessee River. Additionally, the town of Triana is located approximately one-half mile from the western boundary of RSA. Plumes of trichlorothene (TCE) and perchlorate are known to extend onto properties within the boundary of Huntsville and adjacent areas of Madison County. The land uses in the vicinity of the plume are primarily residential land, with some minor commercial activity. Concentrations of TCE in groundwater samples have exceeded EPA's Maximum Contaminant Level of 5 micrograms per liter.

3. SCOPE: This MOA addresses the restriction and denial of well installations and review of pond or pool construction within a half-mile buffer surrounding the RSA boundary (see Attachment A).

Currently, a groundwater plume containing detectable concentrations of perchlorate, TCE, and other volatile organic compounds is known to extend approximately 1,500 feet from the RSA boundary in the southeastern corner of the Arsenal. The plume exits RSA in an area extending from north of Redstone Road south to slightly south of Buxton Road. The extent of the off-post plume covers an area of approximately 350 acres. A map of this area is provided as Attachment B. This plume represents the only off-post groundwater known to be impacted by releases from RSA.

This MOA will facilitate the implementation objective selected in the Interim Record of Decision for Installation-Wide Groundwater that is intended to help prevent the residential use and consumption of contaminated groundwater by restricting the installation of new water supply wells in areas where groundwater contamination may exist. This action will also help prevent further plume migration beyond the boundary of RSA by prohibiting the installation of water supply wells or ponds that may have negative impacts to the groundwater remediation system.

4. AGREEMENTS: The parties of this MOA hereby agree as follows:

a. The Army at RSA will:
   (1) Provide a copy of the Final RSA-146 Phase I Remedial Investigation Report which presents data on the nature and extent of the off-post groundwater plume currently identified within the City of Huntsville. This report includes such information as plume maps delineating breadth and depth of the plume, groundwater sampling data tables, potentiometric data tables, and a summary of remediation activities performed to date.
   (2) Provide updates to this report as they are developed and will provide reports for any other groundwater site where plume migration is found to occur outside of the RSA boundary.
   (3) Report its findings annually to EPA, Alabama Department of Environmental Management, City of Huntsville, City of Madison, Madison County, and Morgan County.
   (4) Coordinate with the City of Huntsville to confirm the location of all wells, ponds, or pools constructed within the previous calendar year within the half mile buffer surrounding the RSA boundary and to evaluate the effectiveness of the control.

b. The City of Huntsville will:
   (1) Identify requests for well installation permits, pond or pool construction within a half-mile buffer surrounding the RSA boundary, as identified on Attachment A, and in the boundary of the City of Huntsville within 60 days of such requests.
   (2) Make the final determination as to the areas where well, pool, or pond installation permits are banned, limited, or allowed based upon their assessment of information and data provided by the Army. Huntsville will grant, grant with limitations, or deny the well installation permit request in accordance with Huntsville ordnances. No water supply wells will be

permitted within the area identified on Attachment A unless it can be shown that installation of the well will not threaten public health or the environment.

(3) Notify the Army within 60 days if the City of Huntsville allows the installation of a well, pool, or pond within the half-mile buffer of the RSA boundary.

c. In the event that an unpermitted well is drilled within the plume area, the Parties will cooperate in corrective action and enforcement needed to prevent the domestic use of the contaminated groundwater.

5. RESERVATION OF RIGHTS: The Parties understand that this MOA is not intended to create additional legal rights or obligations between the Parties. Nothing in this MOA is to imply that any signatory government is in any way abrogating or ceding any responsibilities or authority under CERCLA or any other federal or state law.

6. MODIFICATION AND TERMINATION: Modification of this MOA must be in writing and approved by all Parties currently party to the MOA. This MOA shall be in effect from the date of execution until termination by agreement of the Parties.

7. LIMITATIONS: This MOA is not a funding document and does not commit any signatory agency to obligate funds to other parties. Each agency's participation in this MOA is subject to availability of funds authorized and available for obligation by the agency.

8. THIRD PARTY CHALLENGES OR APPEALS: This MOA does not create or authorize a basis for any third-party claim, challenges, or appeals to the actions of the Parties.

9. EXECUTION: This MOA may be executed in counterparts. A copy with all original signature pages affixed shall constitute the original MOA. The effective date of this MOA shall be the date of the signature of the Party who is last to sign. This MOA shall remain effective for a period of three years. At the end of three years, the MOA will be reviewed, updated, and resigned (if appropriate).

_____ _____

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The Army at Redstone Arsenal
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_____ _____

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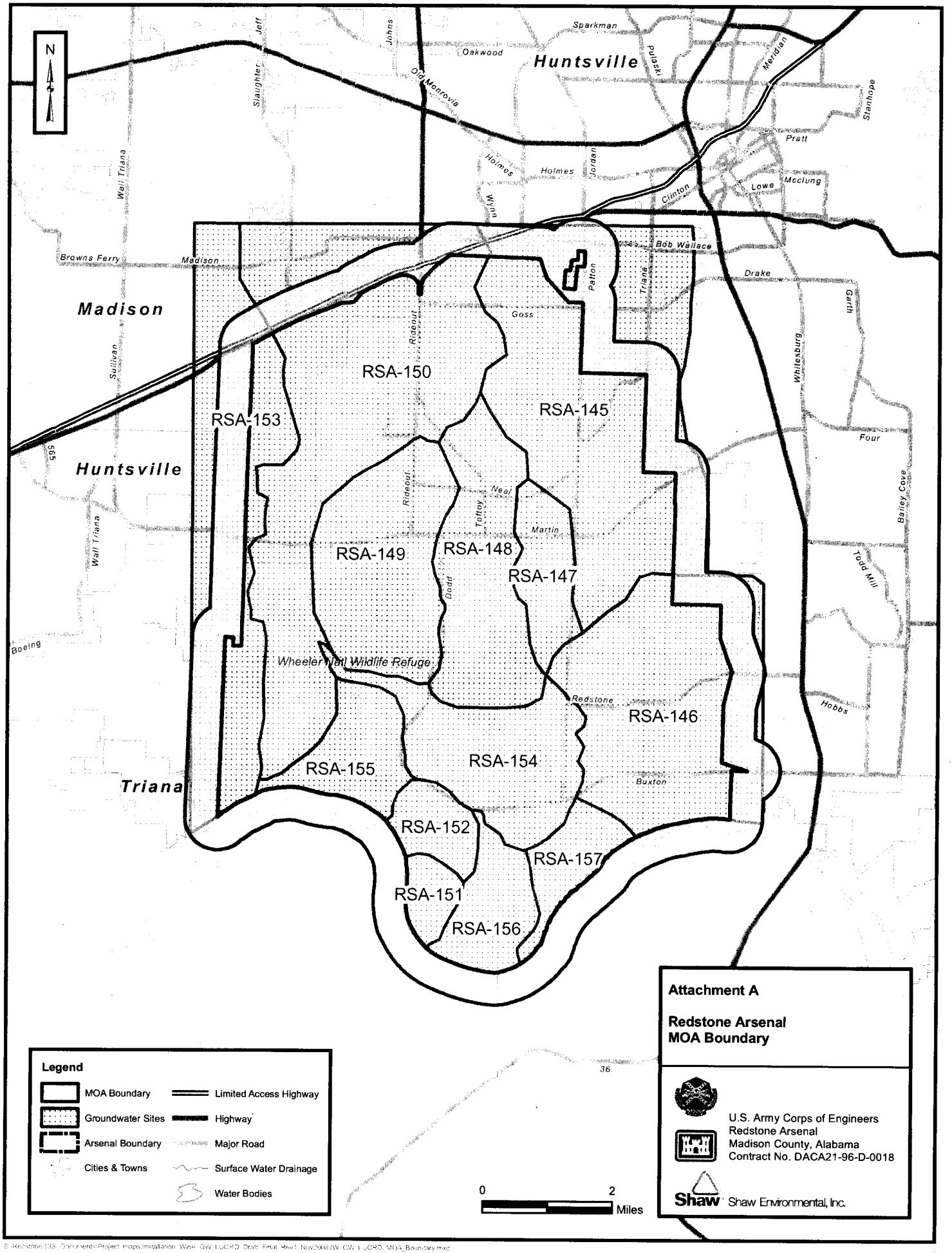

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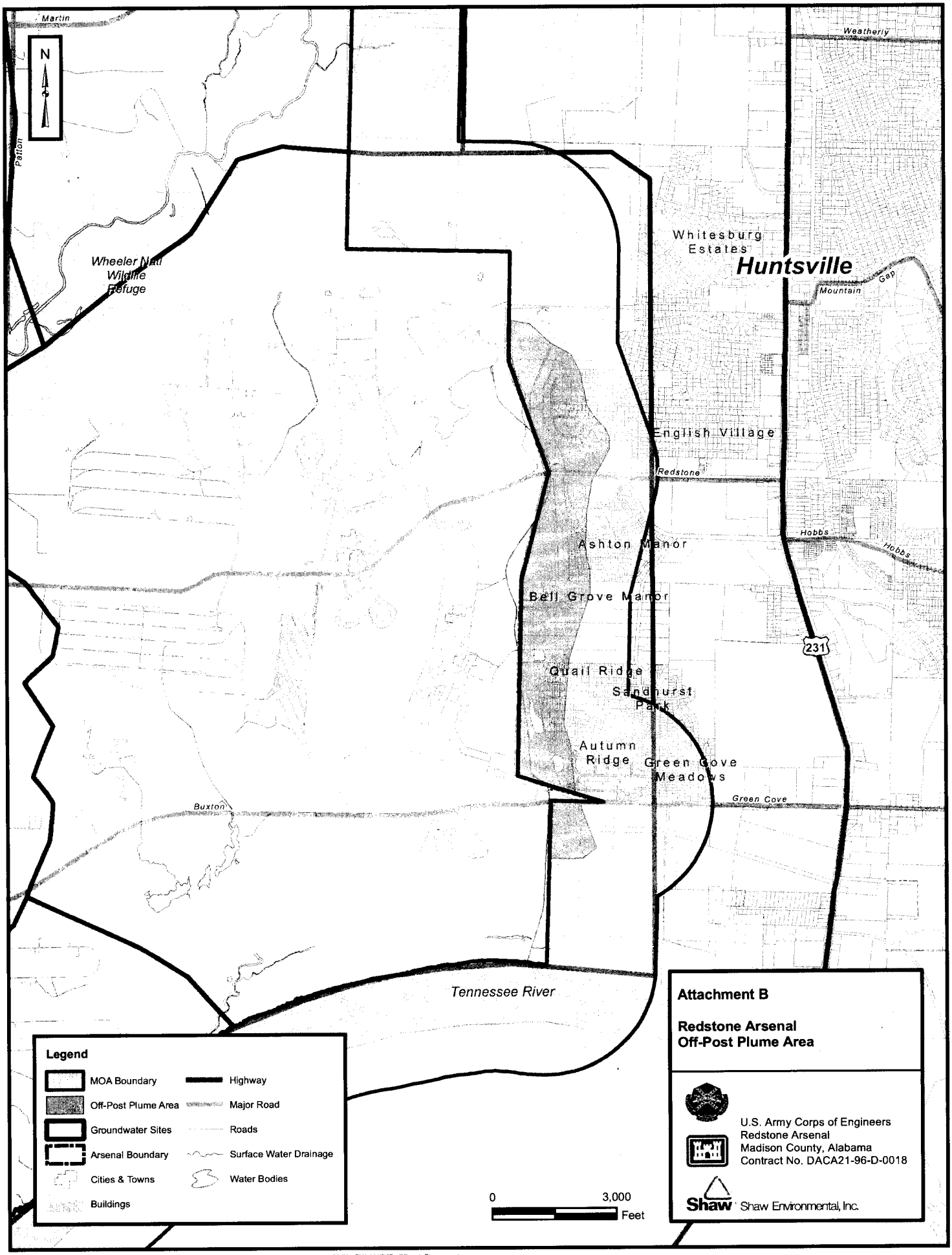

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APPENDIX C

MEMORANDUM OF AGREEMENT
REDSTONE ARSENAL AND MADISON COUNTY
(INCLUDING CITY OF MADISON AND TOWN OF TRIANA)

MEMORANDUM OF AGREEMENT
BETWEEN
US ARMY GARRISON-REDSTONE ARSENAL
AND
MADISON COUNTY, ALABAMA
(INCLUDING THE CITY OF MADISON AND THE TOWN OF TRIANA)

SUBJECT: Use of Groundwater

1. PURPOSE: This Memorandum of Agreement (MOA) between the United States Army (Army) and Madison County, including the City of Madison and the Town of Triana, is entered into to oversee the well permitting process and its role in controlling exposure to contaminated groundwater in the vicinity of the Redstone Arsenal (RSA).

The Army enters into this MOA pursuant to the authority of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. § 9601 et seq., and the Defense Environmental Restoration Program, 10 U.S.C. § 2700 et seq. Madison County enters into this MOA pursuant to State of Alabama Law 22-24, Code of Alabama Regulations 335-9, Madison City Code Section 13-170, and Title 22.

The purpose of this MOA is to provide a framework for cooperation and coordination between the Parties in order to prevent or minimize potential exposure of off-post residents or workers to contaminated groundwater, and to prevent further migration of the RSA plume off of the Arsenal. The Army and the U.S. Environmental Protection Agency (EPA) selected this action as part of the remedy in the September 2007 Interim Record of Decision under CERCLA to address contaminated groundwater on an installation-wide basis. The Army, as the lead agency for this Interim Remedial Action, intends to utilize the Madison County well permitting process for implementing the objective to protect human health and the environment.

2. BACKGROUND: As described in the Interim Remedial Action for Installation-Wide Groundwater Interim Record of Decision (September 2007), RSA is bordered by four local government entities. The city of Huntsville and Madison County surround RSA to the north, east, and west. The city of Madison is adjacent to a very small portion of the northwest corner of the Arsenal. Morgan County lies south of the Arsenal across the Tennessee River. Additionally, the town of Triana is located approximately one-half mile from the western boundary of RSA. Plumes of trichlorothene (TCE) and perchlorate are known to extend onto properties within the boundary of Huntsville and adjacent areas of Madison County. The land uses in the vicinity of the plume are primarily residential land, with some minor commercial activity. Concentrations of TCE in groundwater samples have exceeded EPA's Maximum Contaminant Level of 5 micrograms per liter.

3. SCOPE: This MOA addresses the restriction and denial of well installations and review of pond or pool construction within a half-mile buffer surrounding the RSA boundary (see Attachment A).

Currently, a groundwater plume containing detectable concentrations of perchlorate, TCE, and other volatile organic compounds is known to extend approximately 1,500 feet from the RSA boundary in the southeastern corner of the Arsenal. The plume exits RSA in an area extending from north of Redstone Road south to slightly south of Buxton Road. The extent of the off-post plume covers an area of approximately 350 acres. A map of this area is provided as Attachment B. This plume represents the only off-post groundwater known to be impacted by releases from RSA.

This MOA will facilitate the implementation objective selected in the Interim Record of Decision for Installation-Wide Groundwater that is intended to help prevent the residential use and consumption of contaminated groundwater by restricting the installation of new water supply wells in areas where groundwater contamination may exist. This action will also help prevent further plume migration beyond the boundary of RSA by prohibiting the installation of water supply wells or ponds that may have negative impacts to the groundwater remediation system.

4. AGREEMENTS: The parties of this MOA hereby agree as follows:

a. The Army at RSA will:
   (1) Provide a copy of the Final RSA-146 Phase I Remedial Investigation Report, which presents data on the nature and extent of the off-post groundwater plume currently identified within Madison County. This report includes such information as plume maps delineating breadth and depth of the plume, groundwater sampling data tables, potentiometric data tables, and a summary of remediation activities performed to date.
   (2) Provide updates to this report as they are developed and will provide reports for any other groundwater site where plume migration is found to occur outside of the RSA boundary.
   (3) Report its findings annually to EPA, Alabama Department of Environmental Management, Huntsville, city of Madison, Madison County, and Morgan County.
   (4) Coordinate with Madison County to confirm the location of all wells, ponds, or pools constructed within the previous calendar year within the half-mile buffer surrounding the RSA boundary and to evaluate the effectiveness of the control.

b. Madison County, including the city of Madison and the town of Triana, will:
   (1) Identify requests for well installation permits, pond or pool construction within a half-mile buffer surrounding the RSA boundary, as identified on Attachment A, and in the boundary of Madison County within 60 days of such requests.
   (2) Make the final determination as to the areas where well, pool or pond installation permits are banned, limited, or allowed based upon their assessment of information and data provided by the Army. Madison County will grant, grant with limitations, or deny the well installation permit request in accordance with Madison County ordnances. No water supply wells will be

permitted within the area identified on Attachment A unless it can be shown that installation of the well will not threaten public health or the environment.

(3) Notify the Army within 60 days if Madison County allows the installation of a well, pool, or pond within the half-mile buffer of the RSA boundary.

c. In the event that an unpermitted well is drilled within the plume area, the Parties will cooperate in corrective action and enforcement needed to prevent the domestic use of the contaminated groundwater.

5. RESERVATION OF RIGHTS: The Parties understand that this MOA is not intended to create additional legal rights or obligations between the Parties. Nothing in this MOA is to imply that any signatory government is in any way abrogating or ceding any responsibilities or authority under CERCLA or any other federal or state law.

6. MODIFICATION AND TERMINATION: Modification of this MOA must be in writing and approved by all Parties currently party to the MOA. This MOA shall be in effect from the date of execution until termination by agreement of the Parties.

7. LIMITATIONS: This MOA is not a funding document and does not commit any signatory agency to obligate funds to other parties. Each agency's participation in this MOA is subject to availability of funds authorized and available for obligation by the agency.

8. THIRD PARTY CHALLENGES OR APPEALS: This MOA does not create or authorize a basis for any third party claim, challenges, or appeals to the actions of the Parties.

9. EXECUTION: This MOA may be executed in counterparts. A copy with all original signature pages affixed shall constitute the original MOA. The effective date of this MOA shall be the date of the signature of the Party who is last to sign. This MOA shall remain effective for a period of three years. At the end of three years, the MOA will be reviewed, updated, and resigned (if appropriate).

Terry de la Paz
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(Date)

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Madison County
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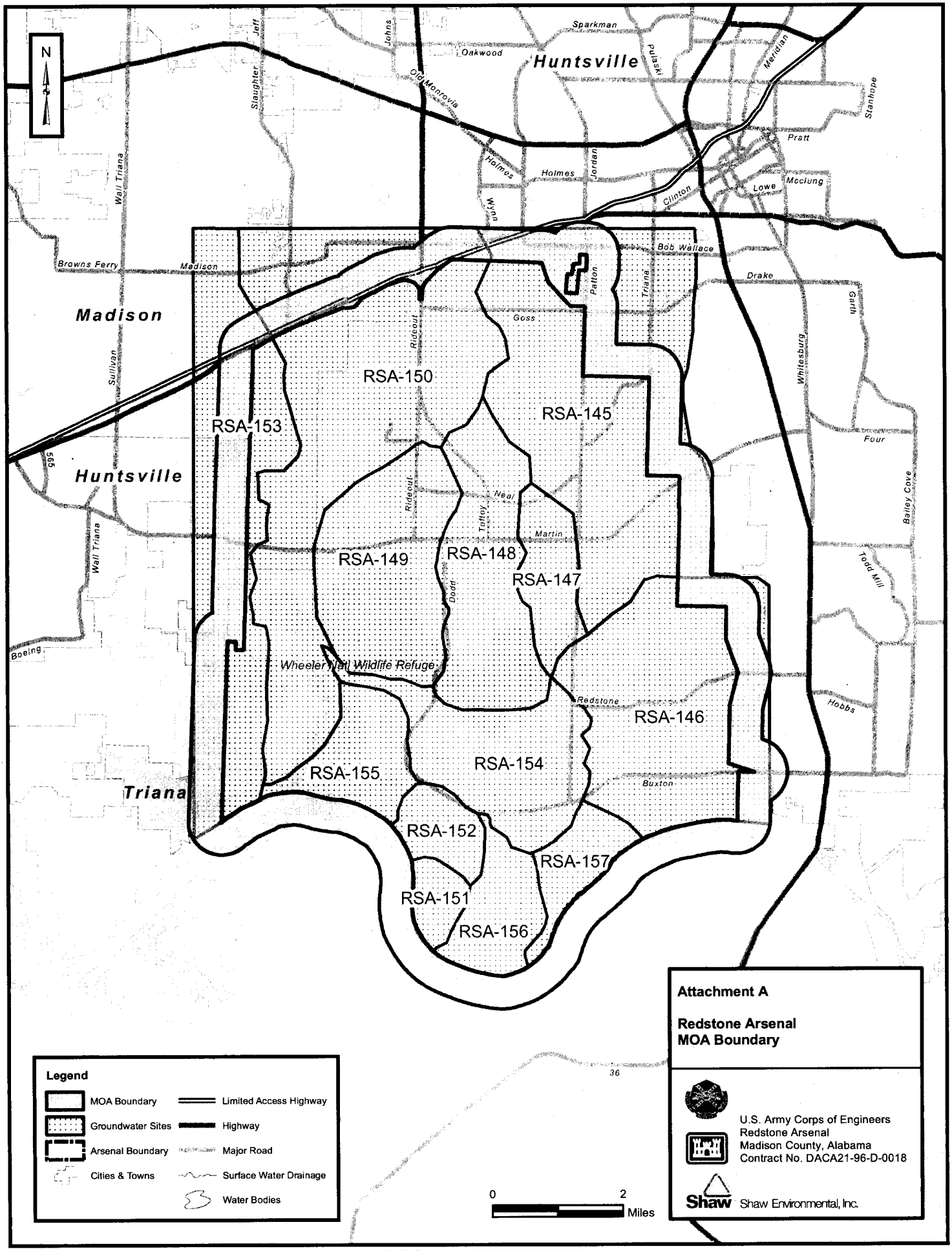
(Date)



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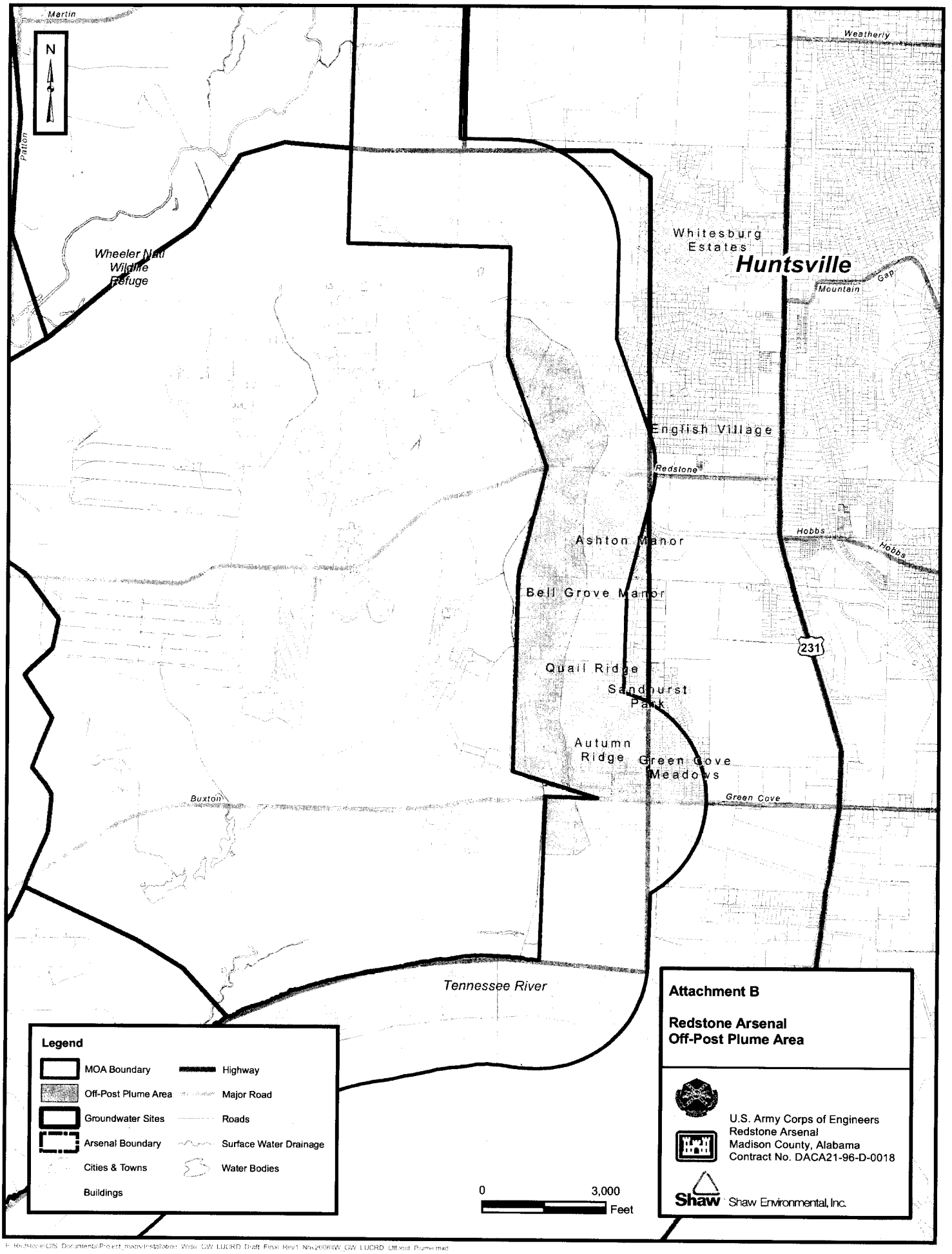

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APPENDIX D

MEMORANDUM OF AGREEMENT
REDSTONE ARSENAL AND MORGAN COUNTY

MEMORANDUM OF AGREEMENT
BETWEEN
US ARMY GARRISON-REDSTONE ARSENAL
AND
MORGAN COUNTY, ALABAMA

SUBJECT: Use of Groundwater

1. PURPOSE: This Memorandum of Agreement (MOA) between the United States Army (Army) and Morgan County is entered into to oversee the well permitting process and its role in controlling exposure to contaminated groundwater in the vicinity of the Redstone Arsenal (RSA).

The Army enters into this MOA pursuant to the authority of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. § 9601 et seq., and the Defense Environmental Restoration Program, 10 U.S.C. § 2700 et seq. Morgan County enters into this MOA pursuant to State of Alabama Law 22-24, Code of Alabama Regulations 335-9, and Title 22.

The purpose of this MOA is to provide a framework for cooperation and coordination between the Parties in order to prevent or minimize potential exposure of off-post residents or workers to contaminated groundwater, and to prevent further migration of the RSA plume off of the Arsenal. The Army and the U.S. Environmental Protection Agency (EPA) selected this action as part of the interim remedy in the September 2007 Interim Record of Decision under CERCLA to address contaminated groundwater on an installation-wide basis. The Army, as the lead agency for this Remedial Action, intends to utilize the Morgan County well permitting process for implementing the objective to protect human health and the environment.

2. BACKGROUND: As described in the Interim Remedial Action for Installation-Wide Groundwater Interim Record of Decision (September 2007), RSA is bordered by four local government entities. The city of Huntsville and Madison County surround RSA to the north, east, and west. The city of Madison is adjacent to a very small portion of the northwest corner of the Arsenal. Morgan County lies south of the Arsenal across the Tennessee River. Additionally, the town of Triana is located approximately one-half mile from the western boundary of Redstone Arsenal. Plumes of trichlorothene (TCE) and perchlorate are known to extend onto properties within the boundary of Huntsville and adjacent areas of Madison County. The land uses in the vicinity of the plume are primarily residential land, with some minor commercial activity. Concentrations of TCE in groundwater samples have exceeded EPA's Maximum Contaminant Level of 5 micrograms per liter.

3. SCOPE: This MOA addresses the restriction and denial of well installations and review of pond or pool construction within a half-mile buffer surrounding the RSA boundary (see Attachment A).

Currently, a groundwater plume containing detectable concentrations of perchlorate, TCE, and other volatile organic compounds is known to extend approximately 1,500 feet from the RSA boundary in the southeastern corner of the Arsenal. The plume exits RSA in an area extending from north of Redstone Road south to slightly south of Buxton Road. The extent of the off-post plume covers an area of approximately 350 acres. A map of this area is provided as Attachment B. This plume represents the only off-post groundwater known to be impacted by releases from RSA.

This MOA will facilitate the implementation objective selected in the Interim Record of Decision for Installation-Wide Groundwater that is intended to help prevent the residential use and consumption of contaminated groundwater by restricting the installation of new water supply wells in areas where groundwater contamination may exist. This action will also help prevent further plume migration beyond the boundary of RSA by prohibiting the installation of water supply wells or ponds that may have negative impacts to the groundwater remediation system.

4. AGREEMENTS: The parties of this MOA hereby agree as follows:

a. The Army at RSA will:
   (1) Provide a copy of the Final RSA-146 Phase I Remedial Investigation Report, which presents data in on the nature and extent of the off-post groundwater plume currently identified within Morgan County. This report includes such information as plume maps delineating breadth and depth of the plume, groundwater sampling data tables, potentiometric data tables, and a summary of remediation activities performed to date.
   (2) Provide updates to this report as they are developed and will provide reports for any other groundwater site where plume migration is found to occur outside of the RSA boundary.
   (3) Report its findings annually to the EPA, Alabama Department of Environmental Management, Huntsville, City of Madison, Madison County, and Morgan County.
   (4) Coordinate with Morgan County to confirm the location of all wells, ponds, or pools constructed within the previous calendar year within the half mile buffer surrounding the RSA boundary and to evaluate the effectiveness of the control.

b. Morgan County will:
   (1) Identify requests for well installation permits, pond or pool construction within a half-mile buffer surrounding the RSA boundary, as identified on Attachments A, and in the boundary of Morgan County within 60 days of such requests.
   (2) Make the final determination as to the areas where well, pool, or pond installation permits are banned, limited, or allowed based upon their assessment of information and data provided by the Army. Morgan County will grant, grant with limitations, or deny the well installation permit request in accordance with Morgan County ordnances. No water supply wells will be

permitted within the area identified on Attachment A unless it can be shown that installation of the well will not threaten public health or the environment.

(3) Notify the Army within 60 days if Morgan County allows the installation of a well, pool, or pond within the half mile buffer of the RSA boundary.

c. In the event that an unpermitted well is drilled within the plume area, the Parties will cooperate in corrective action and enforcement needed to prevent the domestic use of the contaminated groundwater.

5. RESERVATION OF RIGHTS: The Parties understand that this MOA is not intended to create additional legal rights or obligations between the Parties. Nothing in this MOA is to imply that any signatory government is in any way abrogating or ceding any responsibilities or authority under CERCLA or any other federal or state law.

6. MODIFICATION AND TERMINATION: Modification of this MOA must be in writing and approved by all Parties currently party to the MOA. This MOA shall be in effect from the date of execution until termination by agreement of the Parties.

7. LIMITATIONS: This MOA is not a funding document and does not commit any signatory agency to obligate funds to other parties. Each agency's participation in this MOA is subject to availability of funds authorized and available for obligation by the agency.

8. THIRD PARTY CHALLENGES OR APPEALS: This MOA does not create or authorize a basis for any third party claim, challenges, or appeals to the actions of the Parties.

9. EXECUTION: This MOA may be executed in counterparts. A copy with all original signature pages affixed shall constitute the original MOA. The effective date of this MOA shall be the date of the signature of the Party who is last to sign. This MOA shall remain effective for a period of three years. At the end of three years, the MOA will be reviewed, updated, and resigned (if appropriate).

_____ _____

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_____ _____

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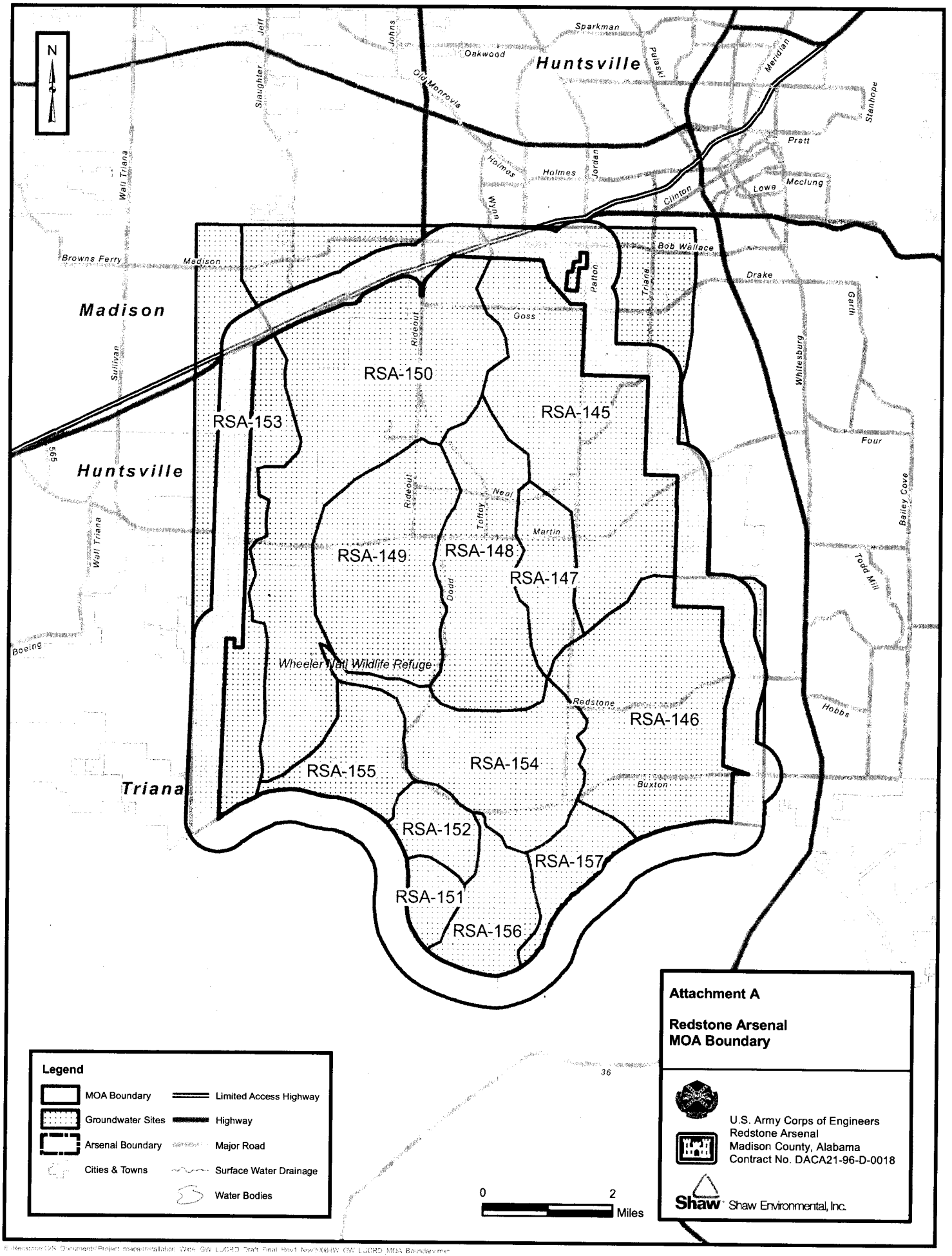

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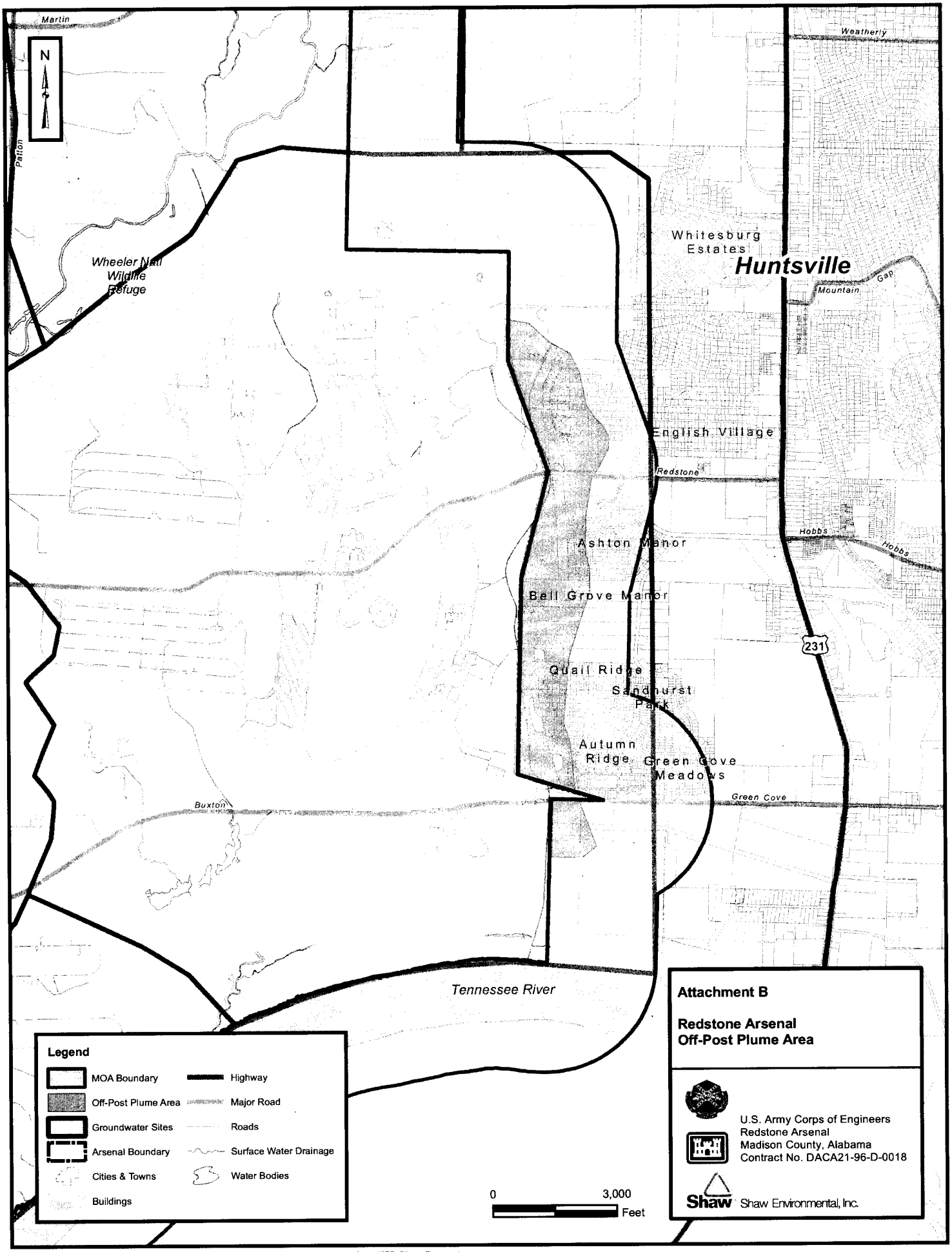

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APPENDIX E

INSTALLATION-WIDE GROUNDWATER LAND-USE CONTROL INTERIM REMEDIAL ACTION INSPECTION CHECKLIST

Installation-Wide Groundwater Land Use Control Interim Remedial Action Inspection Checklist
Redstone Arsenal
Madison County, Alabama

Inspection Items	Findings/Existing Conditions	Actions Needed	Date Action Completed
Installation-Wide Groundwater Land-Use Controls Inspection			
Were all wells and springs inspected in this annual review? Are any signs on wells or springs in need of maintenance/replacement?			
Were any maps or educational materials for hunting, fishing, and other recreational use revised and reissued this year to inform visitors to RSA of groundwater restrictions?			
Were any off post well permits or permits for other off-post construction reviewed as per requirements of the MOAs in the past year?			
Has the IRP/MMRP work plan been reviewed this year and were any updates needed?			
Were any groundwater wells installed or unused wells brought into service for nonpotable uses?			
Have any notifications of action interfering with LUC effectiveness been issued this year?			
Have any reports of unmanaged exposure to contaminated groundwater been received this year?			
Note: This inspection is to be performed annually. Date of Inspection: _____ Printed Name/Organization: _____ Signature: _____			

GIS - Geographic Information System.
IRP - Installation Restoration Program.
LUC - Land-use control.
MMRP - Military Munitions Response Program.
MOA - Memorandum of agreement.
RSA - Redstone Arsenal.
SAC - Site access control.

Response to U.S. Environmental Protection Agency (EPA) Comments on Draft Final Rev. 1 Installation-Wide Groundwater Land-Use Control Remedial Design, Madison County, Redstone Arsenal, Alabama February 2009

Specific Comments by Ms. Michelle Thornton, EPA RPM dated April 20, 2009.

Comments from the Review of the EPA Remedial Design LUC Checklist Items # 10-19.

Comment 1: **EPA Comment on Checklist Item 12: Requirement met. Section 4.1.4, page 13/EPA COMMENT: The language cited on page 13 is adequate; however, on page 15 the last sentence in section 4.1.7 includes additional Check List 12 language for post transfer. For the language on page 15 please change "the appropriate regulator" to "EPA".**

Response 1: The last part of the referenced sentence will be changed from "(3) modify or terminate a LUC, the transferee or lessee must first obtain written concurrence from the Army and the appropriate regulator(s)" to "(3) modify or terminate a LUC, the transferee or lessee must first obtain written concurrence from the Army, EPA, and ADEM, or property owner."

Comment 2: **EPA Comment on Checklist Item 16: Requirement partially met. Section 4.1, page 9/EPA comment: The signs need to be described in more detail. The content and deadline for placement must be described.**

Response 2: Agreed. The text of the signs which have been posted at the wells and at the springs will be included in Section 4.1.2. The text of the signs which have just been posted at the springs reads "NOTICE, CONTAMINATED GROUNDWATER SPRING LOCATED NEARBY. WATER NOT SUITABLE FOR DRINKING." The text of the signs which have just been posted at the potentially potable wells reads "NOTICE, NON-POTABLE WATER NOT FOR DRINKING OR COOKING USE." Signs are in place or are currently being posted and this information will be included in this section of the LUC RD.

Comment 3: **EPA Comment on Checklist Item 17: Requirement met. Sections 4.1, page 9 and 4.1.2, page 11. Enhancement of Site Access Control Program. EPA COMMENT: The language says that the Army will notify EPA of any "programmatic changes" to their internal procedures. Please describe programmatic changes or delete the word "programmatic."**

Response 3: The word "programmatic" will be deleted.

General Comments

Comment 1: **Section 3.0, page 7. It is not clear that the three objectives on page 7 address all the risks described on page 10.**

Response 1: The text in this section will clarify that the three objectives listed on page 7 are those identified in the IROD for *Installation-Wide Groundwater* (Shaw, 2007). However, during development of this LUC RD, other exposure routes to potentially contaminated groundwater were identified, as noted on page 10. Text will be added to Section 3.0 to clarify that a further LUC objective is to minimize threats to site workers from inadvertent exposure to contaminated groundwater from both direct and indirect pathways. Text in this section will also clarify that this exposure may occur either as a result of nonpotable groundwater use or from exposure to groundwater during work activities such as construction or maintenance of sumps.

Comment 2: **Section 3.0, page 7. The 2nd objective, "control the use" is too broad. Please provide additional, specific language.**

Response 2: The Army and EPA engaged in lengthy discussions and negations to develop this LUC objective. These discussions included Mike Newman, EPA legal support and Jennifer Murphy, AEC legal support. The intent of this LUC objective was to ensure that threats from all nonpotable exposures to groundwater, either through nonpotable use (such as lawn watering) or from exposure to groundwater during work activities, were minimized as much as possible. To address the concerns raised by EPA in this comment, the discussion of the intent of this LUC objective will be included in the text that follows the three bullets on page 7.

Comment 3: **Section 3.0, page 7. None of the objectives appear to address the risk to recreational users. Please address.**

Response 3: The LUC objective in bullet 1 on page 7 addresses the potential risks to recreational users from drinking groundwater which has daylighted into springs and seeps. No other exposure pathways to groundwater were determined to be complete for recreational users. Signage stating that groundwater consumption from springs and seeps is prohibited will be posted at or near contaminated springs and seeps. Text clarifying that the LUC objective in bullet 1 addresses threats to workers, visitors, and recreational users will be added to Section 3.0.

Comment 4: **Section 3.0, page 7. The 3rd "objective" is not an objective, but rather a commitment to take an action. Please re-phrase this objective.**

Response 4: As stated above, the text in this section will clarify that the three objectives listed on page 7 are those identified in the IROD for *Installation-Wide Groundwater* (Shaw, 2007). However, text will be added to clarify that the intent of this objective is to prevent exposure to off site residents, workers, and groundwater users from exposure to Army-related contaminants in off site groundwater. The

action to be taken to achieve this objective will be to initiate formal coordination with local governments as is discussed elsewhere in this LUC RD.

Comment 5: **Section 3.0, page 6, last full sentence, please note that the Interim LUC action will reduce risk to human health, as stated in the second sentence. Please reconcile the second and last sentences.**

Response 5: This text will be reconciled by deleting the statement that the IRA will not result in risk reduction, which while true in the context of the sentence does appear to conflict the second sentence in this paragraph. The last full sentence will only state that the IRA will not result in contaminant reduction.

Comment 6: **Section 3.0, page 6, the last sentence misstates the trigger for the CERCLA Five Year Review. Please revise to read, "Since the remedial action leaves waste in place at levels that does not allow for unrestricted use and unlimited exposure during this IRA, CERCLA five-year reviews will be required."**

Response 6: The existing text will be edited as requested.

Comment 7: **Section 3.0, the third full paragraph discussed the location regulations and ordinances that regulate well installation. Please include all of the specific references to the specific ordinances and regulations, with a brief description of their scope and operation.**

Response 7: The Installation-Wide Groundwater IROD presents a complete discussion of the existing ordnances including the information requested in this comment. To address this comment, Table 16 of the IROD, which presents the enforcement authority for water well installation and water well quality for local government entities, and the text that discusses this table will be added to Section 4.1.2 of the LUC RD.

Comment 8: **Section 4.1.2. On page 10 the third bullet describes a LUC database to track the SAC program as well as other LUCs. Please clarify which other LUCs will be tracked in the database. If there are no "other LUCs," then delete "other LUCs."**

Response 8: The database maintained under the SAC is used to track LUCs at all applicable IRP sites. There are currently other sites with LUCs and the Army anticipates that additional IRP sites will use LUCs as part of their remedies in the future.

Comment 9: **Section 4.1.6. The last sentence on page 11 provides examples of LUCs and references zoning. If zoning is not relevant to Redstone, please remove this as an example.**

Response 9: The reviewer is correct that zoning is not relevant to Redstone Arsenal. Zoning will be removed as an example in this list.

Reference:

Shaw Environmental, Inc. (Shaw), 2007, ***Final Interim Record of Decision, Interim Remedial Action for Installation-Wide Groundwater, Redstone Arsenal, Madison County, Alabama,*** prepared for U.S. Army Corps of Engineers, Savannah District, September.